

SPECTRUM MANAGEMENT AND THIRD GENERATION WIRELESS SERVICE

HEARING

BEFORE THE

SUBCOMMITTEE ON COMMUNICATIONS

OF THE

COMMITTEE ON COMMERCE,
SCIENCE, AND TRANSPORTATION
UNITED STATES SENATE

ONE HUNDRED SEVENTH CONGRESS

FIRST SESSION

JULY 31, 2001

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ONE HUNDRED SEVENTH CONGRESS

FIRST SESSION

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SPECTRUM MANAGEMENT AND THIRD GENERATION WIRELESS SERVICE

TUESDAY, JULY 31, 2001

U.S. SENATE,
SUBCOMMITTEE ON COMMUNICATIONS,
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION,
Washington, DC.

The Subcommittee met, pursuant to notice, at 2:30 p.m. in room SR-253, Russell Senate Office Building, Hon. Daniel K. Inouye, Chairman of the Subcommittee, presiding.

OPENING STATEMENT OF HON. DANIEL K. INOUE, U.S. SENATOR FROM HAWAII

Senator INOUE. We are here today to address two important missions, third generation wireless service, and the management of spectrum. Our ability to resolve issues surrounding 3G will have a significant impact on the health and competitiveness of the wireless industry. I expect that a resolution of the 3G issue will also be instructive with respect to policies of spectrum management. It was in the 1980s that companies like AT&T and the Baby Bells began providing wireless mobile phone service referred to as cellular service.

However, it was only in the 1990s when Congress authorized the FCC to auction additional spectrum for personal communications service that the wireless phone industry truly began to blossom. PCS became a catalyst for the industry's transition from analog to digital. The question we now face is how to complete the next step. That is the transition to third generation wireless services.

Clearly, whether or not U.S. service providers and manufacturers of third generation service will be able to compete successfully will depend in part on the decisions of policymakers. In this regard, the issue we face today is identifying sufficient spectrum for 3G transition. While the International Telecommunications Union has allocated the 806 to 960, 1710 to 1885, and 2500 to 2690 megahertz bands for 3G service, our industry has set its sights on the 1755 to 1850 megahertz band. The Department of Defense, the primary user of spectrum in this band, has indicated that it cannot effectively share the band with 3G technologies.

If additional spectrum is necessary for 3G services, some form of compromise must be reached. If the only option is to relocate the Defense Department, we must find comparable spectrum, develop a migration timeframe that allows DOD to maintain its operation as it vacates the spectrum, and ensure that the department's costs are reimbursed. These monumental tasks must be accomplished

without risking any reduction in military preparedness or degradation of systems that support mission capabilities.

We are facing difficult issues with respect to 3G services because with increasing consumer demand for wireless service, spectrum has become scarce. Congress took an important step in distributing spectrum quickly and efficiently when it authorized the FCC to auction spectrum. Since that time, the FCC has implemented other spectrum management tools such as spectrum caps and band managers in order to promote competition and more quickly disseminate spectrum.

As the FCC seeks to implement additional tools for spectrum management, it must make sure that its role in allocating spectrum and assigning licenses is clear. The wireless industry is competitive and consumers have benefited from this competition. However, the FCC must continue to fulfill its responsibilities in assuring that consumers are well served through its spectrum management policies. I welcome the witnesses, and I look forward to hearing your testimony.

[The prepared statement of Senator Inouye follows:]

PREPARED STATEMENT OF HON. DANIEL K. INOUE,
U.S. SENATOR FROM HAWAII

We are here today to address two important issues—third generation (3G) wireless service and the management of spectrum. Our ability to resolve issues surrounding 3G will have a significant impact on the health and competitiveness of the wireless industry. I expect that a resolution of the 3G issue will also be instructive with respect to policies of spectrum management.

It was in the 1980s that companies like AT&T and the Baby Bells began providing wireless mobile phone service referred to as cellular service. However, it was only in the 1990s, when Congress authorized the Federal Communications Commission (FCC) to auction additional spectrum for personal communications service (PCS), that the wireless phone industry truly began to blossom. PCS became a catalyst for the industry's transition from analog to digital. The question we now face is how to complete the next step—that is, the transition to third generation wireless services.

Clearly, whether or not U.S. service providers and manufacturers of third generation service will be able to compete successfully will depend, in part, on the decisions of policymakers. In this regard, the issue we face today is identifying sufficient spectrum for the 3G transition. While the International Telecommunications Union has allocated the 806 to 960, 1710 to 1885, and 2500 to 2690 megahertz bands for 3G service, industry has set its sights on the 1755 to 1850 megahertz band. The Department of Defense, the primary user of spectrum in this band, has indicated that it cannot effectively share the band with 3G technologies. If additional spectrum is necessary for 3G services, some form of compromise must be reached. If the only option is to relocate the Defense Department, we must find comparable spectrum, develop a migration timeframe that allows the Defense Department to maintain its operations as it vacates the spectrum, and ensure that the Department's costs are reimbursed. These monumental tasks must be accomplished without risking any reduction in military preparedness or degradation of systems that support mission capabilities.

We are facing difficult issues with respect to 3G services, because, with increasing consumer demand for wireless service, spectrum has become scarce. Congress took an important step in distributing spectrum quickly and efficiently when it authorized the FCC to auction spectrum. Since that time, the FCC has implemented other spectrum management tools such as spectrum caps and band managers in order to promote competition and more quickly disseminate spectrum. As the FCC seeks to implement additional tools for spectrum management, it must make sure that its role in allocating spectrum and assigning licenses is clear. The wireless industry is competitive and consumers have benefited from this competition. However, the FCC must continue to fulfill its responsibility in ensuring that consumers are well-served through its spectrum management policies.

I welcome the witnesses and look forward to hearing their testimony.

Senator INOUE. May I call upon the Chairman for his thoughts.

**STATEMENT OF HON. ERNEST F. HOLLINGS,
U.S. SENATOR FROM SOUTH CAROLINA**

Senator HOLLINGS. Mr. Chairman, we really thank you for setting this hearing. It is probably the most important hearing we have had in communications this year. I say that because you have noted that this is not just a customary hearing on spectrum, but that we intend to do something. I say that in light of the fact that 20 years ago, we had similar hearings.

When we talk about the actual sale, auction of the spectrum, it wasn't done from the spectrum's benefit and purpose, on the contrary, just for financial needs. What we need to do is really allocate that spectrum for this 3G mobile satellite system, wireless system that, on a fail basis, there is no question that the Defense Department will be defended.

I am not worried about the cost of spectrum moneys. We can reimburse that, and you more or less have been in charge of the defense appropriations as the Ranking Member for years, so I am not worried about reimbursing the Department of Defense, but I am more concerned that we get something done. You cannot get any better witnesses than what we have right at that panel.

If we get something conclusive rather than a litany, then we know about all the problems. You can keep on testifying and testifying about these problems, and the next thing you know, the Europeans will go forward with this third generation wireless service. Then it could be that yes, the Federal Express man delivering the goods in Europe can talk, but the troops in Kosovo cannot. I mean, that is by way of emphasis. We are not in this alone. We are not in charge. We have got to respond to the technological developments, and I do not know of any better hearing. Let me ask that my full statement be included in the record.

[The prepared statement of Senator Hollings follows:]

PREPARED STATEMENT OF HON. ERNEST F. HOLLINGS,
U.S. SENATOR FROM SOUTH CAROLINA

Mr. Chairman, I appreciate your leadership in calling today's hearing to examine the steps that we, as policymakers, can and must take to facilitate the development of third generation (3G) wireless services in the United States.

On October 13, 2000, President Clinton issued an executive memorandum directing all Federal agencies to identify spectrum that could be made available for 3G products and services. The principal result of that order has been to focus primary attention on two bands of spectrum in the United States identified by the international community as appropriate for 3G mobile systems: (1) the 1710-1885 MHz band, used by Federal agencies including the Department of Defense; and (2) the 2500-2690 MHz band, currently allocated to instructional television fixed services and multichannel, multipoint delivery services (MMDS).

The merits of sharing and/or clearing these bands have been extensively studied by NTIA, DOD, and the FCC. As a result, I am happy that representatives from these three agencies are with us today to share their findings, to debate the relative merits of the various approaches, and to begin the difficult but necessary task of charting a course forward toward a spectrum management policy that will allow U.S. businesses to compete in the global market for 3G products and services.

Still, while it is important that we move forward, we must not in our haste neglect the valid concerns of incumbent license holders—in particular, the impact of band clearing or sharing on our national security interests and on the commercial expectations of incumbent licensees. Ultimately, it is my hope that the testimony of today's witnesses will bring us closer to a consensus that protects our domestic

security interests and encourages innovation in the development of new consumer products and services.

The array of consumer services to be offered in a 3G world is nothing short of dazzling. Small handheld devices no bigger than a pack of cigarettes will connect to the Internet at high speeds, allowing consumers to quickly download songs, exchange photographs, or receive streaming video. Yet, unless we begin to act decisively, with a common voice and a common purpose, U.S. communications companies risk falling further behind their global competitors.

As guardians of this public resource, it is the duty of this administration, the FCC, and this Congress to develop a reasoned approach toward management of the radio spectrum that will facilitate the development of 3G services. Accordingly, while the promise of robust 3G consumer services in the United States may be years away, this hearing could not be more timely.

I look forward to listening to the recommendations of our distinguished panel of witnesses and to their responses to our questions.

Senator INOUE. Without objection, so ordered.
Senator Burns.

**STATEMENT OF HON. CONRAD BURNS,
U.S. SENATOR FROM MONTANA**

Senator BURNS. Thank you, Mr. Chairman. Thank you for holding this hearing today. As you know, we had talked about this a long time ago, and I appreciate the opportunity of participating on this important issue. I want to remind my colleagues on the panel that if you think there was a lot of moving parts in the 1996 Telco Act, when you start down the road of reforming and taking a look at managing spectrum, and looking at reforms, you have not seen anything yet. And because this is the information age, it is a bonus. Some people believe that we are already there in the advent of the wireless communications devices, laptops and of course, handhelds.

I believe we have only begun the journey into the age of information. Yes, we have witnessed many amazing technological advancements over the past decade, but as a society, we have not fully realized the total impact that these technologies will have on the way we live and the way we interact on a day-by-day basis. Put in another way, the second and third order effects of the information revolution have only begun to occur. For example, I foresee the day when our information devices will be the extensions of our very personalities, the ability to meet and interact with other people both approximately and personally will be greatly enhanced by our ability to share information.

Already we have seen entirely new ways to buy goods through services such as e-bay, and as an auctioneer, I take offense to that. No, not really. That wasn't written in here, folks. I will guarantee you that. But I will find that an example of real life human interaction. E-bay is a second order effect in the simple email technology. Imagine what's going to happen in the 3G for the third generation industries.

3G offers a personal interconnection never before imagined. When the telegraph and the telephone were invented, we tried to imagine what our forefathers would have thought at such abilities. As we tried to envision the communications wonders before us, we are, like our forefathers, completely unaware of what the future in the age of information holds for our children and our grandchildren and yes, our great grandchildren. That said, even though our forefathers could not imagine our current technical abilities, their wis-

dom foretold and facilitated the industrial revolution. Today, we are faced with a similarly daunting task.

Clearly, there are many dimensions to the information age, but none more important than the use and the availability of spectrum. The U.S. Senate must carefully consider this manner. The issue at hand is not simply the allocation of spectrum for 3G, but also how to best define a process for managing this valuable commodity in such a way to ensure national security, ensure, encourage commerce, but most of all, propel our transition into the information age.

I look forward to working with the Chairman and the rest of my colleagues on this panel as we start down this road to reforming the way we manage our spectrum, and of course, making way for the next generation. Thank you very much, Mr. Chairman.

Senator INOUE. I thank you very much. And may I now recognize the Vice Chairman of the Subcommittee, the gentleman from Alaska.

**STATEMENT OF HON. TED STEVENS,
U.S. SENATOR FROM ALASKA**

Senator STEVENS. Thank you very much. Mr. Chairman, my office has now been approached by several educational and religious groups who want to protect the continued availability of this band, GHC band. We have also been approached by several industry groups who want this block of spectrum to remain under consideration by the FCC. The first group wanted to have it removed from consideration obviously. I am really here because I'd like to find a way to ask both sides what will be the situation with regard to the total spectrum situation if this block of spectrum is taken off the table, what is its impact, particularly on the spectrum that is now so vital to our national defense. Thank you very much.

Senator INOUE. Thank you.

The gentleman from Oregon, Mr. Wyden.

**STATEMENT OF HON. RON WYDEN,
U.S. SENATOR FROM OREGON**

Senator WYDEN. Thank you, Mr. Chairman. I congratulate you, Mr. Chairman, for holding this hearing and making it clear that we are going to be dealing with a very difficult issue in a bipartisan fashion. Obviously, today's challenge is finding spectrum for 3G wireless, but I am of the view that some day there is going to be a 4G or a 5G or an entirely different wireless application we haven't even imagined yet, and without fundamental reform, the current firestorm over 3G spectrum in my view will just be repeated again and again.

It seems to me that the central problem I would say to my colleagues is that we have got a jurassic system. It has been virtually unchanged since 1920s when spectrum was used for radio and radio only, and it is creating all of the wrong incentives. If you are an incumbent license holder, you want to keep licenses scarce. You occupy as much spectrum as possible, and you fight tooth and nail against giving any up. In effect, you sort of collect ransom for holding the spectrum hostage, and if you have got a bright new idea

for the use of spectrum, you have to have a lot of patience for a lot of red tape.

It seems to me we have a variety of reforms that we ought to be looking at. But to me, one of the centerpieces that effort ought to be to make sure that licensees in the future have some flexibility and incentives to sell or lease excess spectrum, instead of hoarding it. We all understand this resource that you cannot see or touch is now one of the most important natural resources in the information age economy, and as far as I am concerned, you have got to have some reforms that are going to harness the power of marketplace forces so that we are going to go about using the spectrums as efficiently as possible. I thank you, Mr. Chairman, for a chance to speak for a moment this afternoon.

Senator INOUE. I thank you very much.

May I now recognize the gentleman from Nevada, Mr. Ensign.

**STATEMENT OF HON. JOHN ENSIGN,
U.S. SENATOR FROM NEVADA**

Senator ENSIGN. Thank you, Mr. Chairman. I want to thank you for holding this hearing. I will keep my comments very brief, as I agree with the Senator from Oregon that the marketplace is critical, decreasing some of the red tape that goes on, but also we do have to take in the national security implications here, and I think that those are not mutually exclusive entities. I am looking forward to questioning some of the witnesses and hearing some of their testimony to try and work some of these issues out. I think it is critical that this body understand these issues. They are very complex. We are dealing not only with making law, but we are dealing with such a scientifically technical area, that we need outside experts to help advise us on these issues, as we do with most issues, but particularly, when we are dealing with such advanced technological issues, and so I am looking forward to working with my colleagues here to try to craft some legislation that will permit us as Americans to make sure that America does not fall behind in so many important areas, especially in technology. Thank you, Mr. Chairman.

Senator INOUE. I thank you very much. The gentleman from West Virginia.

**STATEMENT OF HON. JOHN D. ROCKEFELLER IV,
U.S. SENATOR FROM WEST VIRGINIA**

Senator ROCKEFELLER. Thank you, Mr. Chairman. At Katherine Graham's funeral, former Secretary of Defense Jim Schlesinger approached me. We talked about Ms. Graham for a moment, and he said to me, why did you sign that letter, and I said what do you mean? He said you signed the spectrum letter that sort of relegated the Department of Defense to being irrelevant. I have very, very strong friendship and admiration for Jim Schlesinger, and so I was really taken aback by that comment.

On checking, I found that the letter that we sent was put by, passed through the Defense Department and proofed, but regardless of any of that, it raises the question of the difficulty of what we do. When I consider what has to be done in defense, I am overwhelmed. When I consider what has to be done on 3G, much less

5G, I am overwhelmed. When I consider the approach that the knowledge base in this Congress about spectrum matters has been, I am underwhelmed. When I consider the time we have in which to do something intelligent and useful, I am again overwhelmed. So this hearing, anything is timely.

Senator INOUE. I thank you very much. Now, we will call upon the first panel. First the Acting Administrator of National Telecommunications and Information Administration, Mr. William T. Hatch. Then the Deputy Chief for the Office of Engineering and Technology, FCC, Mr. Julius Knapp, and the Acting Assistant Secretary of Defense for Command, Control, Communications and Intelligence, Mr. Linton Wells II.

Mr. Hatch.

STATEMENT OF WILLIAM T. HATCH, ACTING ASSISTANT SECRETARY FOR COMMUNICATIONS AND INFORMATION ADMINISTRATION, DEPARTMENT OF COMMERCE

Mr. HATCH. Thank you, Mr. Chairman. Mr. Chairman and Ranking Members, and other Members of the Subcommittee, I want to thank you for inviting me to testify today on spectrum allocation process, and also the accommodation of third generation wireless systems in the United States. As you stated, Mr. Chairman, I am Bill Hatch, Acting Assistant Secretary for Communications and Information and Acting Administrator of the NTIA within the Department of Commerce. I am also the Associate Administrator at NTIA's Office of Spectrum Management. As Members of this Subcommittee know, NTIA serves as the spectrum manager for the Federal agencies and is also the principal advisor to the President on communications and information policy. Because of NTIA's unique role, the agency must then balance the spectrum interests of the Federal agencies while also advancing policies that promote the benefits of technology development in the United States for all of the telecommunications users.

As you noted, the spectrum allocation process originally established by the Communications Act of 1934 has grown and adapted to change in both the private sector and the Federal Government spectrum requirements, and for the introduction of new technologies. The Federal Communications Commission on behalf of the private sector and NTIA on behalf of Federal agencies have coordinated their efforts on almost a daily basis to ensure that our goals are met now and in the future.

Unfortunately, Mr. Chairman, this task is becoming more complicated given the proliferation and increasing proliferation of wireless technology and applications. Available spectrum is particularly scarce in the popular frequency band we are considering now below 3 gigahertz. I might note that over 90 percent of the government and private sector authorizations by NTIA and FCC are in the spectrum below 3 gigahertz. Of this spectrum below 3 gigahertz, over 55 percent is shared, 14 percent is Federal Government exclusive, and 31 percent is non-Federal Government exclusive.

Despite congestion in these frequencies, finding spectrum for below 3 gigahertz with a deployment of new technology such as third generation wireless is a complex and challenging process. Over the past decade, there has been tremendous growth world-

wide in the use of cellular-based wireless communications. The Department of Commerce and NTIA believes that this growth will continue.

While current cellular and PCS wireless systems are expected to evolve into 3G over time, as you noted, there is a strong desire from the wireless industry for additional spectrum to establish 3G networks. The International Telecommunications Union has been fostering the development of advanced mobile systems, and that arena is currently referred to as IMT or International Mobile Telecommunications 2000, we will refer to it here as 3G, for a number of years.

The last World Radio Conference in 2000 in Istanbul, Turkey, adopted a resolution that states that approximately 160 megahertz of additional spectrum will be needed to meet the projected requirements of 3G in those areas where the traffic is highest, and this need will be required by 2010. There were a number of frequency bands identified at the conference, and resolution provided that each country may determine which of the bands to implement domestically, taking into account the impact on incumbent services. Here in the United States, we are now in the process of deciding which of the various frequency bands is most appropriate for implementation of 3G services.

As a result of the cooperation between the Department of Commerce, Department of Defense, and the Federal Communications Commission, and other Federal agencies, the Department of Commerce, under guidelines set forth last year, has developed an ambitious action plan to identify spectrum for 3G. To date, both NTIA and FCC have completed reports on the 1710 to 1850 megahertz band and the 2599 to 2690 megahertz band that you referred to. We have conducted outreach programs within the industry.

In addition, you will hear from the FCC, and they have issued a notice of proposed rulemaking addressing 3G issues, and have received public comments from the issues raised in the NPRM. Because of the complex issues surrounding the allocation of spectrum for 3G, there is a general agreement amongst the Department of Commerce, the FCC, and the affected agencies to continue these efforts so that we may carefully study the various spectrum options that have been proposed both in our studies, the FCC studies and by the private sector, so that we can carefully study the various options to arrive at the best possible decision for the United States.

In recognition of this work that remains to be done, Chairman Powell recently sent a letter to Secretary Evans suggesting that additional time to study all these options would be desirable, and requested that the department work with the FCC to come up with a revised allocation plan and auction timetable. Secretary Evans responded by agreeing with the Chairman that continuing these efforts would ensure that the final 3G allocation decision would be the best possible decision we could make. He has directed me to work with the FCC and the Federal agency to develop a new plan for the section of 3G spectrum and consider ways to achieve flexibility on the statutory auction date if such a flexibility is needed to implement this new plan. I am happy to report, Mr. Chairman, that in accordance with Secretary Evans' memo, we have already started preliminary discussions with Federal agencies, including

the FCC about establishing a new plan and timetable for selecting 3G spectrum. I thank you for this opportunity to share my views with you. I'd be pleased to answer any questions the Subcommittee may have.

Senator INOUE. Thank you very much, Mr. Hatch.

[The prepared statement of Mr. Hatch follows:]

PREPARED STATEMENT OF WILLIAM T. HATCH, ACTING ASSISTANT SECRETARY FOR COMMUNICATIONS AND INFORMATION ADMINISTRATION, DEPARTMENT OF COMMERCE

Mr. Chairman, Ranking Member and other Members of this Subcommittee, I want to thank you for inviting me to testify today on spectrum matters relating to the spectrum allocation process and the accommodation of third generation (3G) wireless systems in the United States. I am William T. Hatch, Acting Assistant Secretary for Communications and Information, and Acting Administrator of the National Telecommunications and Information Administration (NTIA) within the Department of Commerce. I am also the Associate Administrator in NTIA's Office of Spectrum Management.

One of NTIA's responsibilities is to serve as the President's principal advisor on telecommunication policies. The agency's other primary responsibility on behalf of the President is to manage the radio frequency spectrum used by the Federal agencies in satisfying their missions. In this role, NTIA processes the Federal agencies' request for frequency assignments; provides Executive Branch leadership in coordinating both current and future spectrum requirements among the Federal agencies; and with the Federal Communications Commission (FCC) and the Department of State, develops and promotes positions at Treaty Conferences and other technical and management fora of the International Telecommunication Union (ITU) regarding United States spectrum management interests. Because of NTIA's unique role, the agency must balance the spectrum interests of the Federal agencies while also advancing policies that promote the benefits of technological developments in the United States for all users of telecommunications services.

NTIA's management of the Federal use of radio spectrum also promotes public safety and competition. As the managers of Federal spectrum, the agency is trying to improve efficiency, increase private access to spectrum resources, and plan for future spectrum needs, including those relating to public safety. These goals will become increasingly important as global uses of satellite and wireless devices increase. In this regard, I am pleased that the Subcommittee is looking into the matter of the allocation process and 3G wireless services, and would like to begin my remarks today by giving a brief background on the national allocation process, our accomplishments on 3G to date, and our plans for the future.

NATIONAL ALLOCATION PROCESS

In 1934, the Communications Act was signed into law establishing the respective responsibilities for spectrum management in the United States. The statute reserved to the President the authority to make radio frequencies available to all stations belonging to or operated by the United States. NTIA exercises this authority on behalf of the President ensuring that federal agencies can meet their critical communications needs in the areas of national defense and security, air safety, maintenance and preservation of our natural resources, law enforcement, management of national disasters, exploration of space, and other Federal Government services and functions. The Communications Act of 1934 also created the FCC as an independent agency with the responsibility to manage the spectrum to meet the needs of the state and local governments and the private sector.

To meet the respective needs of the private sector and federal government, the President, through NTIA and its predecessors, and the FCC over the past 67 years have allocated approximately 300 GHz of usable radio spectrum into government exclusive, non-government exclusive and "shared" bands. This 300 GHz of usable spectrum has been divided up over the years into approximately 900 bands, each being allocated to one or more of 41 radiocommunication services such as broadcasting, mobile, fixed, and mobile satellite.

The FCC makes domestic spectrum allocation decisions through public rulemakings. NTIA coordinates its allocation decisions in government-exclusive bands through the Interdepartment Radio Advisory Committee (IRAC), which is comprised of representatives from the major spectrum users among the Federal agencies. The FCC and NTIA coordinate on any spectrum allocation decisions involving "shared" bands. The FCC and NTIA work together on a daily basis to coordinate spectrum

decisions that affect their mutual constituencies and to ensure that the current and future communications needs of both the government and private sector are satisfied.

SPECTRUM USE

Over the years, spectrum use has expanded from the very low frequency ranges to the higher frequency ranges. As shown in Figure 1, over 93% of all licensees and Federal Government frequency authorizations are in the 0 to 3 gigahertz (GHz) range. Of the spectrum below 3 GHz, 14% of the spectrum is Federal Government exclusive, 31% is non-Federal Government exclusive, and the remaining 55% is shared. Throughout the usable spectrum, NTIA has authorized the use of some 440,000 assignments for Federal Government use and the protection of spectrum used by our neighbors, Canada and Mexico, and other frequencies specified by the FCC. Approximately 40% of the assignments authorized by NTIA for Federal agency use are used by the Department of Defense as shown in Figure 2. NTIA processes approximately 300 to 500 Federal agency requests for frequency assignment actions daily.

The entire spectrum management process has to be flexible, dynamic, adaptable to changing requirements, and timely to meet the national needs for spectrum. The spectrum below 3 GHz is extremely congested, and thus, finding spectrum below 3 GHz for the deployment of new technologies such as 3G services will be a complex and challenging process.

I would now like to address how the national spectrum management process has dealt with and will continue to deal with finding additional spectrum for 3G services.

3G BACKGROUND

Although in the United States our wireless services are not generally distinguished by a "generation" label, we might classify the early cellular telephones as the "first generation" of wireless services that brought nationwide mobile telephone services to hundreds of thousands of Americans. Building on the success of cellular service, the current personal communications services ("PCS") could constitute the "second generation" of wireless services. These services bring digital voice and messaging services to the Nation. In recent years, there has been robust competition in the field of wireless services. This competition has promoted lower rates, greater customer choice, and higher quality of service.

Over the past decade there has been a tremendous growth worldwide in the use of cellular-based wireless telecommunications systems. The Department of Commerce and NTIA believe that this global growth will continue. The "third generation" (or "3G") systems advanced by industry propose to provide mobile and satellite-based broadband capabilities. While current cellular and PCS wireless systems are expected to evolve to 3G technology over time, there is a strong desire from the wireless industry for additional spectrum now to establish 3G networks.

In recognition of this growth and the trend toward global markets for wireless services, the International Telecommunication Union (ITU) has considered the spectrum requirements for evolving 3G systems, which is internationally termed International Mobile Telecommunications-2000, or IMT-2000. At the May 2000 World Radiocommunication Conference (WRC-2000) in Istanbul, Turkey, an ITU-established agenda item called for the review of spectrum and regulatory issues for advanced mobile applications in the context of IMT-2000. The ITU acknowledged the need to provide additional spectrum, particularly for the terrestrial component of IMT-2000 applications. The ITU forecast that 160 MHz of additional spectrum would be required for 3G systems. This amount is over and above that spectrum already allocated internationally for 1- and 2G systems. The ITU identified several frequency bands that could be used for IMT-2000 systems. However, member administrations of the ITU retained the right to implement any of the bands in any time frame, for any service or technology, and could use any portion of the identified bands that they deemed appropriate to satisfy national requirements.

CURRENT STATUS

In October 2000, then President Clinton signed an Executive Memorandum which stated the need and urgency for the United States to select radio frequency spectrum for 3G. The Memorandum articulated principles to serve as guideposts for future actions that would be taken related to the development of 3G, and directed Federal agencies to undertake certain activities. Under the Memorandum, the Secretary of Commerce was directed to work cooperatively with the FCC to take certain actions that would enable the FCC to identify, in coordination with NTIA, 3G spec-

trum and to auction licenses to competing applicants by September 30, 2002. In addition, the Secretary of Commerce was directed to work with government and industry representatives through a series of public meetings to develop recommendations and plans for identifying spectrum for 3G wireless systems. The Secretaries of Defense, Treasury, Transportation, State and other agency heads were directed to participate and cooperate with this government-industry group. The Secretary of State was directed to coordinate and present the views of the United States to foreign governments and international bodies. The FCC was encouraged to participate in this government-industry outreach program and to initiate a rulemaking to identify spectrum for 3G, in coordination with NTIA, with the goal of allocating 3G spectrum so that licenses could be made available via auction by September 30, 2002.

As a result of cooperation between the Department of Commerce, the Department of Defense, the Federal Communications Commission (FCC), and other Federal agencies, the Department of Commerce, under guidelines set forth by the Executive Memorandum, developed an ambitious action plan to identify spectrum for 3G services. To date, NTIA and the FCC have released interim and final reports on the 1710–1850 MHz band and 2500–2690 MHz band, respectively; conducted a government-industry outreach program; and participated in the State Department's outreach program to foreign governments and international bodies. In addition, the FCC issued a notice of proposed rulemaking.

We are now in the process of deciding which of the various frequency bands is most appropriate for the implementation of 3G services in the United States. The possible bands for allocation for the terrestrial component of IMT-2000 in the United States include the 698–960 MHz, 1710–2025 MHz, 2110–2200 MHz, and 2500–2690 MHz bands. All of these bands are being considered in the FCC's rulemaking process. Two bands, however, the 1755–1850 MHz band (exclusive government spectrum) and the 2500–2690 MHz band (exclusive non-government spectrum) require a more extensive analysis to determine their potential to accommodate 3G services. NTIA has studied the 1755–1850 MHz band and the FCC has studied the 2500–2690 MHz band and the study reports have been entered in the record of the FCC's 3G rulemaking for public comment.

NTIA SPECTRUM REPORT

The NTIA report noted that the 1755–1850 MHz band supports various Federal functions: space telemetry, tracking and control (TT&C); medium-capacity fixed microwave; precision guided munitions; tactical radio relay training; and aeronautical mobile applications such as telemetry, video and target scoring systems. This band is currently allocated on an exclusive basis to the Federal Government for fixed and mobile; and in the 1761–1842 MHz portion, space operation (Earth-to-space) and space research (Earth-to-space) services. This allocation supports Federal space tracking, telemetry and command. Fixed links are operated by Federal agencies for voice, data, and/or video communications where commercial service is unavailable, excessively expensive, or unable to meet required reliability. Applications include law enforcement, emergency preparedness, support for the national air space system, military command and control networks, and control links for various power, land, water, and electric-power management systems. Other fixed links include video relay, data relay, and timing distribution signals. Probably the most critical system in the band is the USAF Space Ground Link Subsystem (SGLS). This system, via Earth-to-space uplinks in the 1761–1842 MHz band, controls the U.S. military satellites, including telecommunications satellites, intelligence gathering satellites, the Global Positioning System (GPS) satellite constellation and U.S. allies.

The NTIA report studied three options as shown in Figure 3 for sharing or segmenting the 1710–1850 MHz band and provided estimated cost information for relocating Government systems to other bands based on the agencies' analyses of their respective systems. In its report, NTIA concluded that without some form of real-time coordination among IMT-2000 operators and the Federal users, sharing between the IMT-2000 systems and Federal ground and airborne systems would be problematic. For example, a Department of Defense analysis (contained as an appendix to the NTIA report) indicated that IMT-2000 base stations would interfere with the control of Federal Government satellites. The Defense Department asserted that it would cost \$3.95 billion (fiscal year 2002 estimate) to relocate its systems from the 1755–1850 MHz band assuming no relocation of satellite systems until the end of their projected useful life and that such relocation could not be completed before the year 2017. The relocation scenarios were contingent on whether spectrum could be identified to which the agencies' operations could be moved.

In its report, NTIA discussed the possible ways in which the 1710–1755 MHz band could be used for 3G services. NTIA previously identified the 1710–1755 MHz band for reallocation to the private sector on a mixed-use basis under the requirements of the Omnibus Reconciliation Act of 1993 (OBRA-93). However, under OBRA-93 the Federal Power Administration and fixed links supporting safety-of-life services were exempted from the requirement. In addition, NTIA protected operations within 16 military areas used for large-scale training exercises. In its final report, NTIA noted that one possible option to accommodate 3G services within the band would be to relocate Federal systems from this band completely if comparable spectrum for these military operations could be found and the Federal Power Administration services were willing to relocate on a voluntary basis. Identifying comparable spectrum is important to the 3G spectrum allocation process because of the need to continue important federal services and because of the provisions of the National Defense Authorization Act for Fiscal Year 2000, which protects Department of Defense uses of the spectrum unless alternative spectrum can be identified that preserves essential military capability.

OUTREACH PROGRAMS

To obtain much-needed technical information and to develop a better understanding of industry's needs, NTIA held a number of industry outreach sessions in which Federal agencies and industry exchanged information on various 3G issues. In addition, the wireless industry hosted several smaller, more focused working group meetings that addressed the operational and sharing possibilities of Federal systems in the 1755–1850 MHz band, and sharing possibilities in the 2500–2690 MHz band. These outreach meetings included NTIA and Department of Defense staff as well as numerous industry stakeholders, including radio manufacturers and wireless service providers. These meetings were invaluable information exchanges—the Federal Government could provide information on radio systems used in the band, and industry could provide their views on the feasibility of IMT-2000 systems sharing with existing Federal systems.

GOING FORWARD

Because of the complex issues surrounding the allocation of spectrum for 3G services, there is a general agreement among Department of Commerce, the FCC and the affected Federal agencies to continue these efforts beyond the original July 2001 target date so that we may study carefully the various spectrum options available to arrive at the best possible decision. In recognition of the work that remains to be done, Chairman Powell recently sent Secretary Evans a letter suggesting that additional time to study options would be desirable and requesting that the Department work with the FCC to come up with a revised allocation plan and auction timetable. Secretary Evans responded by agreeing with the Chairman that continuing these efforts would ensure that the final 3G allocation decision would be the best possible one. He directed NTIA to work with the FCC and other Federal agencies to develop a new plan for the selection of 3G spectrum and to consider ways to achieve flexibility on the statutory auction date if such flexibility is needed to implement the new plan.

I thank you for this opportunity to share with you the views of the NTIA on this critical issue, and I would be pleased to answer any questions you may have.

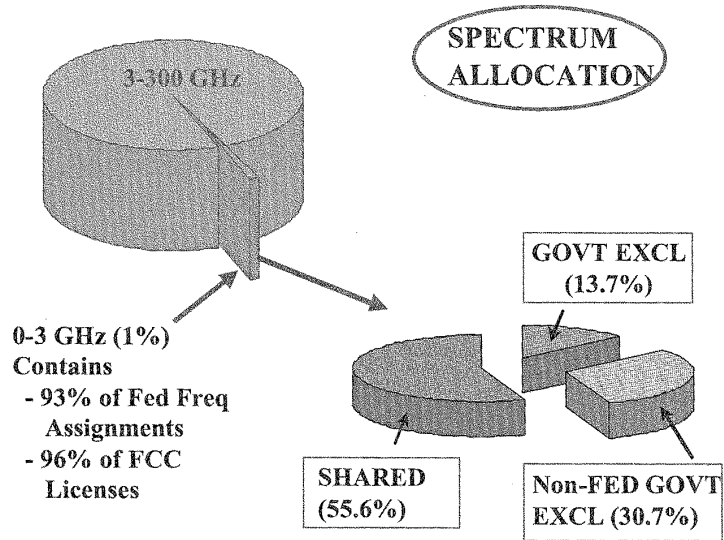


Figure 1

Figure 2

FEDERAL GOVT SPECTRUM USE

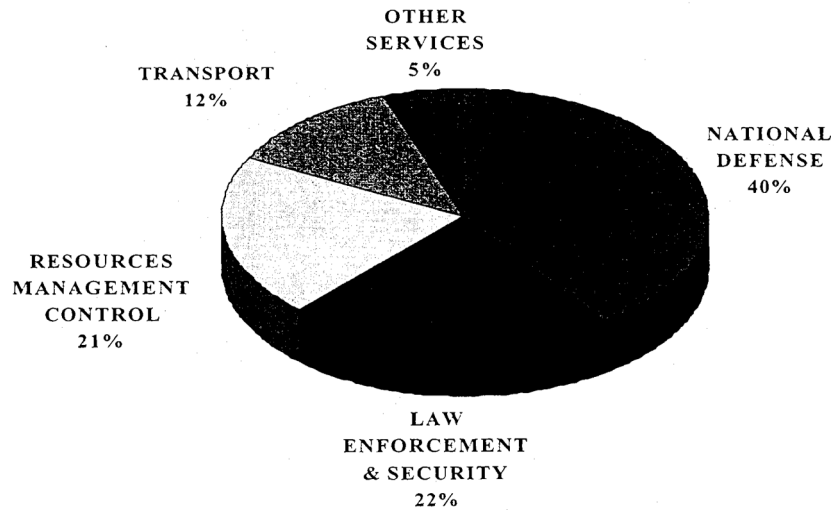
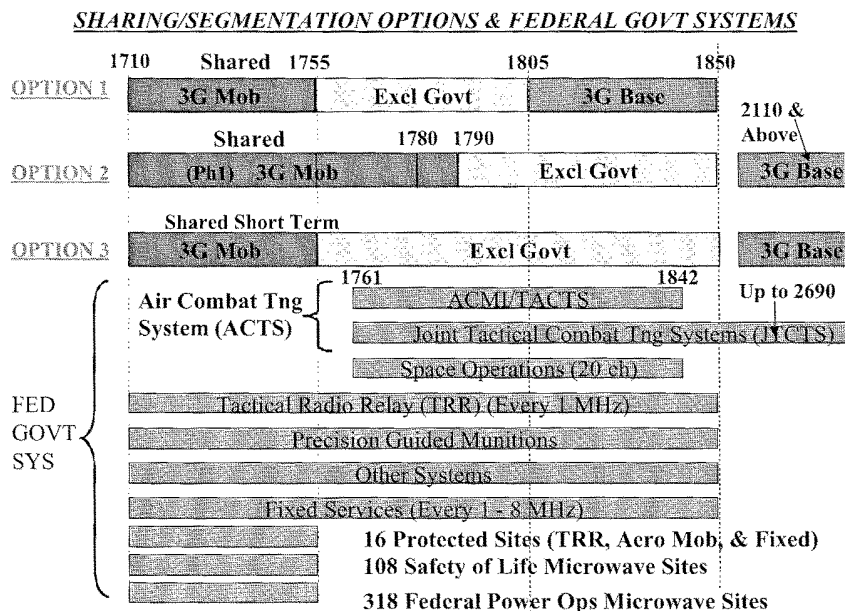


Figure 3



Senator INOUE. I will recognize Mr. Knapp.

STATEMENT OF JULIUS P. KNAPP, DEPUTY CHIEF, OFFICE OF ENGINEERING AND TECHNOLOGY, FEDERAL COMMUNICATIONS COMMISSION

Mr. KNAPP. Thank you, Mr. Chairman. Ranking Member, and Members of the Subcommittee, good afternoon. I am Julius Knapp, the Deputy Chief of the FCC's Office of Engineering and Technology, and I welcome this opportunity to discuss spectrum management issues and focus on allocations for advanced wireless services or so-called third generation 3G mobile radio services.

Unfortunately, Chairman Michael Powell could not be here today, but he shares your interest in spectrum management and the future of 3G. The Commission throughout its history has met the challenge of demands for spectrum that exceed the available supply. This challenge is even greater today as we look to ways to accommodate a growing number of new services and technologies in a finite amount of spectrum.

As spectrum usage has grown, so too have the problems of reallocating spectrum for new uses and developing standards to control interference. The Commission must maintain its ability to form independent judgments on these technical issues so that we can make the best use of the spectrum. The Commission recognizes that effective spectrum management also relies on the development of policies that encourage efficient use of the spectrum and provide licensees with the flexibility to best meet consumer needs.

We continue to develop a wide variety of spectrum management tools to ensure availability of spectrum for the rapid deployment of

new and innovative technologies, as well as promoting the spectrum efficiency. One of the most important emerging technologies is 3G, or advanced wireless communications services. The regulatory challenges inherent in ensuring the rapid deployment of this service require teamwork on a national scale, as well as attention to the most basic principles of spectrum management.

It is crucial that we provide the essential ingredients for success in the marketplace for advanced wireless services. Adequate spectrum capacity and an open competitive deregulatory environment. In order to accomplish these goals, we must work together as a Nation to ensure cooperative atmosphere and unified voice. The Commission is dedicated to working with the industry, other agencies and Congress, to find and deploy the most suitable spectrum. Today's hearing is an important step toward encouraging the development of shared goals and perspectives and we welcome the opportunity to testify here today.

Let me briefly outline the past and current situation. Mr. Hatch told you about the developments in the ITU and the process that we have gone through to work together cooperatively. I won't repeat that.

Late last year the FCC initiated a rulemaking to consider spectrum allocations to facilitate the introduction of advanced wireless services. The Commission's notice of proposed rulemaking invited comment on the types of wireless services that will be provided and the technical characteristics, the amount of spectrum that may be required, spectrum pairing options and a variety of other issues. I'd like to take a moment to focus on the frequency bands.

The Commission invited comment on the extent to which currently allocated spectrum might be used for advanced wireless services, including the frequency bands used by cellular, PCS and SMR services and spectrum recently reallocated for commercial use for TV channels 60 to 69 as a result of the transition to DTV. The Commission invited comment on five new frequency bands that are shown on the chart to the right. We proposed to allocate for mobile and fixed services the 1710 to 1755 megahertz band designated from Federal Government to non-Federal Government use under two budgetary directives.

We sought comment on providing mobile and fixed locations for the 1750 to 1855 band if spectrum is made available for non-Federal Government use. We proposed to designate the 2110-2150 megahertz band for a variety of fixed and mobile services, and that were identified previously for reallocation in the Commission's 1992 reallocation proceeding, and we asked for comment on various approaches for the 2100 to 2690 megahertz band which is currently used for multichannel, multipoint distribution and instruction of television fixed services of MDS. The Commission staff is evaluating the record in its rulemaking to determine how to proceed. Comments filed by the wireless industry suggest that the 1710 to 1850 megahertz band would be the preferred choice for 3G. This spectrum would harmonize spectrum allocations internationally, permit economies of scale and facilitate international roaming.

We have been working in close consultation with the Department of Commerce and the Department of Defense. They are continuing to evaluate whether in addition to the 1710-1755 megahertz band

that has already been identified for transfer, spectrum may be made available in the 1755 to 1850 megahertz band. In addition, the Commission is working to identify non-government spectrum that might be allocated for 3G or serve as relocation spectrum.

The industry is also looking at additional spectrum options. CTIA recently filed a petition with the FCC seeking to reallocate spectrum that was allocated previously to the mobile satellite service.

As Mr. Hatch explained, there has been an exchange of letters between the Chairman of the FCC and Secretary of the Department of Commerce. Both agreed to work together to develop a new plan for selection of spectrum for 3G. The Commission is committed to making spectrum available for new advanced wireless services and will continue to work closely with the Congress, the Federal Government, the Department of Defense and the wireless industry and other spectrum users toward that end. We must approach these issues by balancing the needs of all users through a well-managed national plan. I'd like to thank you, Mr. Chairman, for the opportunity to appear before you today. Thank you.

Senator INOUE. I thank you very much, Mr. Knapp.

[The prepared statement of Mr. Knapp follows:]

PREPARED STATEMENT OF JULIUS P. KNAPP, DEPUTY CHIEF, OFFICE OF ENGINEERING AND TECHNOLOGY, FEDERAL COMMUNICATIONS COMMISSION

Mr. Chairman, Ranking Member, and Members of the Subcommittee: Good morning. I am Julius Knapp, Deputy Chief of the Office of Engineering and Technology at the Federal Communications Commission (FCC). I welcome this opportunity to discuss spectrum management issues, and focus on allocations for advanced wireless service, or so-called third generation (3G) mobile radio services.

Unfortunately, Chairman Michael Powell could not be here today, but he is cognizant of the importance of spectrum management and its role in the future of America. Spectrum management long has been one of the FCC's core responsibilities. We recognize that effective spectrum management is vital to America's national security, as well as our public safety needs, and to ensure the growth of our economy.

The Commission throughout its history has met the challenge of demands for spectrum that exceed the available supply. This challenge is even greater today as we look for ways to accommodate a growing number of new services and technologies in a finite amount of spectrum.

As spectrum usage has grown, so too have the problems of reallocating spectrum for new uses and developing standards to avoid interference. The Commission must maintain its ability to form independent judgments on these technical issues so that we can make the best use of the spectrum.

The Commission recognizes that effective spectrum management also relies on the development of policies that encourage efficient use of spectrum and provides licensees with the flexibility to best meet consumers needs. We continue to develop a wide variety of spectrum management tools to ensure the availability of spectrum for the rapid deployment of new and innovative technologies, as well as promoting spectrum efficiency.

One of the most important emerging technologies is 3G Wireless or advanced wireless communications services. The regulatory challenges inherent in ensuring the rapid deployment of this service require teamwork on a national scale, as well as attention to the most basic principles of spectrum management. It is crucial that we provide the essential ingredients for success in the marketplace for advanced wireless services—adequate spectrum capacity, and an open, competitive de-regulatory environment. In order to accomplish these goals, we must work together as a Nation to ensure a cooperative atmosphere and unified voice. The Commission is dedicated to working with the industry, other agencies, as well as Congress to find and deploy the most suitable spectrum. Today's hearing is an important step toward encouraging the development of shared goals and perspectives—both for spectrum management in general and 3G in particular, and we welcome the opportunity to testify here today.

INTRODUCTION

Commercial mobile radio services have experienced unprecedented strong growth, particularly in the past several years. In the twelve months ending December 2000, the mobile telephony sector generated over \$52.5 billion in revenues and subscribership increased from approximately 86 million to 110 million users.

The first wireless phones, introduced in the 1980s, used analog technology and offered only voice service. The second generation of wireless phones, introduced in the mid-1990s, use digital transmission technology but still primarily offer voice services. Data services are being introduced that allow consumers to use wireless phones and other devices to provide access to the Internet, but transmission speeds are relatively slow by today's standards.

Industry has developed technology for advanced wireless services, referred to as third generation or 3G wireless, that will offer high-speed data rates that make it possible to offer a variety of new voice and advanced services. The United States has been very involved internationally in developing technical standards and identifying spectrum for 3G services.

Late last year, the FCC initiated a rulemaking to consider spectrum allocations to facilitate the introduction of advanced wireless services, such as 3G. Some of the spectrum identified internationally for 3G currently is used in the United States for Federal Government communications systems. The Commission's staff has worked closely with the Department of Commerce in addressing possible spectrum allocations for 3G.

The FCC is continuing its efforts to address the spectrum requirements for 3G systems. I am pleased to report on our progress thus far.

INTERNATIONAL SPECTRUM ALLOCATIONS FOR 3G

The International Telecommunications Union (ITU) has been fostering the development of advanced wireless systems, commonly referred to as International Mobile Telecommunications-2000 (IMT-2000) or 3G systems, for a number of years. The 2000 World Radio Conference (WRC-2000) adopted Resolution 223, which states that approximately 160 MHz of additional spectrum will be needed to meet the projected requirements of IMT-2000 in those areas where traffic is highest by 2010. WRC-2000 identified a number of frequency bands for possible IMT-2000 use and provided that each country may determine which of the bands to implement domestically after taking into account the impact on incumbent services. The WRC-2000 decisions also provided that 3G services may be introduced through evolution of technology in frequency bands used by existing mobile services.

COORDINATION WITH DEPARTMENT OF COMMERCE

The frequency bands identified internationally for possible use for advanced wireless services are allocated in the United States for both Federal Government and non-government use and therefore fall under the spectrum management responsibilities of both the Executive Branch and the Commission. Setting the direction for the Executive Branch, a Presidential Memorandum was issued in October 2000 instructing the Secretary of Commerce to work cooperatively with the Federal Communications Commission to develop a Study Plan to select spectrum for 3G systems.

The Department of Commerce released a "Plan to Select Spectrum for Third Generation (3G) Wireless Systems in the United States" on October 20, 2000. The plan established target dates for completion of spectrum studies by the National Telecommunications and Information Administration (NTIA) and the Federal Communications Commission. The plan also called for the FCC to allocate spectrum by July 2001 and to subsequently establish rules so that spectrum can be assigned by competitive bidding by September 2002.

FCC RULEMAKING

The Commission issued a Notice of Proposed Rule Making ("Notice") in ET Docket No. 00-258 in December 2000 to identify spectrum for advanced wireless services, including third generation and future generations of wireless systems.

Service Requirements

In the Notice, the Commission sought comment on the types of advanced wireless services that will likely be provided and the technical characteristics of such systems. The Commission noted that wireless carriers in the United States employ a variety of technical standards and sought comment on how networks will migrate to new technologies and whether networks have the capacity now to provide data services. We also requested information on the projected demand and growth rates

for mobile data services, the number of licensees needed to meet this demand, how to accommodate global roaming, and other issues.

Amount of Spectrum Needed

The Commission's rulemaking invited comment on the amount of spectrum required for advanced wireless services, for example, whether the 160 MHz of spectrum recommended by WRC-2000 Resolution 223 is required or whether some alternative amount is needed. The Notice states that the Commission intends to identify a flexible allocation for advanced wireless services, noting that it is not Commission policy to set aside spectrum restricted to a given technology.

Frequency Bands

The Commission asked for comment on the extent to which currently allocated spectrum might be used for advanced wireless services. This spectrum includes the frequency bands used by cellular, PCS, and specialized mobile radio services, as well as spectrum recently reallocated for commercial use from TV channels 60–69 as a result of the transition to digital television.

The Notice also invited comments on using additional candidate bands for advanced wireless systems. Three of these bands are ones that the Commission previously identified for reallocation and that the ITU identified for possible 3G use: 1710–1755 MHz, 2110–2150 MHz, and 2160–2165 MHz.

The 1710–1755 MHz band is now used by Federal Government operations and is scheduled for transfer to the private sector on a mixed-use basis by 2004.

The 2110–2150 MHz and 2160–2165 MHz bands are currently used by the private sector for fixed microwave services. The Commission identified these bands several years ago for reallocation to emerging technologies.

The Notice sought comment on whether portions of the 1755–1850 MHz band, which is now used by Federal Government operations, can be made available for advanced wireless services. Recent legislation sets certain conditions before the Department of Defense (DOD) surrenders use of a band, such as this one, in which it is a primary user. Further, Federal Government users in this spectrum would be entitled to compensation for relocation to other bands.

The Commission's rule making asked for comment on whether the 2500–2690 MHz band, which is now used for Instructional Television Fixed Service (ITFS) and Multipoint Distribution Service (MDS), can be used for advanced mobile, as well as fixed services. The proposal also asked whether we should simply add a mobile service allocation to this band or if ITFS/MDS incumbents should be relocated.

Finally, the Notice requested comment on how newly available spectrum for advanced wireless services might be paired and the importance of global harmonization.

The Commission's staff currently is reviewing the comments received in response to this Notice as we evaluate next steps, which I will discuss in a moment.

FCC TECHNICAL REPORT

The staffs of NTIA and the FCC issued Final Reports in March reporting the results of studies for two of the frequency bands under consideration for advanced wireless systems.

The FCC staff report examines the 2500–2690 MHz band. The report explains that this spectrum is heavily occupied by existing ITFS and MDS systems. These services are experiencing and are expected to see significant future growth, particularly in the provision of new broadband fixed access to the Internet. Given the ubiquitous nature of ITFS/MDS, the report found sharing of this spectrum for 3G does not appear feasible. Further, the report found that reallocating a portion of the 2500–2690 MHz band from incumbent services for new third generation mobile wireless services would raise significant technical and economic difficulties.

REIMBURSEMENT FOR FEDERAL RELOCATION

The Strom Thurmond National Defense Authorization Act of 1999 (NDAA 99) mandates that new commercial licensees (assigned via competitive bidding) reimburse Federal Government incumbents forced to relocate spectrum. The reimbursement requirement applies to the 1710–1755 MHz band that has already been identified for transfer from Federal to non-government use. It would similarly apply to the 1755–1850 MHz band if the Federal Government were to make this spectrum available for use by the private sector.

The first application of the mandatory reimbursement provisions is under consideration in a separate Commission (ET Docket 00–221) and NTIA rulemaking proceedings. The Commission's Advanced Services Notice invited comment on relocation rules and reimbursement procedures. The Commission and NTIA invited com-

ment as to how these reimbursement rules and procedures would affect the commercial viability of Federal reallocated spectrum that may be made available for 3G. Concerns raised in the comments focused primarily on the availability of adequate information and reduced uncertainty in the process for potential licensees to develop viable bidding strategies. We are continuing to work closely with NTIA to develop reimbursement policies and procedures that are viable for Federal incumbents as well as prospective new users.

NEXT STEPS

As I mentioned, the Commission is evaluating the record in the Advanced Services Rule making to determine how to proceed. The comments filed by the wireless industry suggest that the 1710–1850 MHz band would be the preferred choice for 3G spectrum. This would partially harmonize U.S. spectrum allocations with those in use or planned internationally. Harmonization would permit economies of scale and reduce costs in manufacturing equipment, as well as facilitate international roaming.

Parts of the 1710–1850 MHz band could be used to harmonize with 2G GSM systems, which are currently used extensively throughout the world and are expected to transition eventually to 3G systems. Other parts of the 1710–1850 MHz band could be paired with the 2110–2150 MHz band to achieve partial harmonization with spectrum recently auctioned in Europe and elsewhere for 3G systems.

The Department of Commerce and the Department of Defense are continuing to evaluate whether, in addition to the 1710–1755 MHz band that has already been identified for transfer, spectrum can be made available in the 1755–1850 MHz band. They have been working closely with industry in consultation with the Commission.

The Commission staff has also been working to identify other possible non-government spectrum bands that might be reallocated for 3G or serve as relocation spectrum. These additional bands could be identified in a Further Notice of Proposed Rulemaking in the near future.

Industry, as well, has been looking at additional spectrum options. For example, the Cellular Telecommunications and Internet Association recently filed a petition with the FCC seeking to reallocate spectrum currently allocated to the mobile satellite service.

Given these developments, on June 26, 2001, FCC Chairman Powell sent a letter to Secretary of Commerce Donald Evans noting that the entire federal government faces a challenging set of issues in addressing how best to make available sufficient spectrum for advanced wireless services. Chairman Powell stated that the public interest would be best served by additional time for informed consideration, even if this results in some delay in reaching a decision. The Chairman also acknowledged that some of the bands identified for 3G are subject to September 30, 2002 statutory auction deadlines. The Chairman offered that, together with the Executive Branch and the Congress, we can come up with a revised allocation plan and auction timetable that would enable the important work in this area to be finalized in the most effective manner.

Secretary Evans recently responded to Chairman Powell's letter and directed the Acting Administrator of the NTIA to work with the FCC to develop a new plan for the selection of 3G spectrum as quickly as possible. This effort will be carried out in close coordination with the appropriate Executive Branch entities, including the National Security Council, the National Economic Council, the Office of Management and Budget, and the Department of Defense. Secretary Evans encouraged the participants to consider ways to achieve flexibility with respect to the statutory auction dates if flexibility is needed to implement the new plan.

CONCLUSION

The Commission is committed to making spectrum available for new advanced wireless services. We will continue to work closely with the Congress, the Federal Government, the Department of Defense, the wireless industry, and other spectrum users towards that end. We must approach these issues by balancing the needs of all users through a well-managed national plan.

I would like to thank you, Mr. Chairman, for the opportunity to appear before you today. This concludes my testimony and I would be pleased to answer any questions you or the other Members may have.

Senator INOUE. May I now recognize Dr. Wells.

**STATEMENT OF LINTON WELLS II, ACTING ASSISTANT
SECRETARY OF DEFENSE FOR COMMAND, CONTROL,
COMMUNICATIONS AND INTELLIGENCE**

Dr. WELLS. Mr. Chairman, thank you very much, Ranking Member and Members of the Subcommittee. DOD recognizes that spectrum is a precious national and international resource. We recognize the world is changing and that we move ahead toward new opportunities. We also recognize our commitment, our importance of being good stewards of the spectrum to which we have granted access, and I will talk more about that in a minute. As Senator Burns mentioned, it is very important that we have a process to go forward to allocate this resource properly, to strengthen our ability to do this, our position of spectrum manager in the department has been elevated to deputy assistant secretary and we are doing internal organizational changes to improve our ability to participate in national and international discussions.

Access to spectrum is absolutely crucial for DOD operations due to the nature of our forces. Mobile ground forces, ships, aircraft can only communicate by the radio frequency spectrum. There is no other way to connect them. Moreover, as we move into the information age and become more networkcentric force this reliance on radio frequency will become even more important. In this context, our national policy must balance government needs. Most U.S. spectrum already is allocated for commercial purposes or for shared commercial and government bands. Of the spectrum most suitable for this kind of mobile wireless, namely 700 to 2700 megahertz, the Federal Government uses only 14 percent. DOD has access to some of this 14 percent, but in most cases we share with other government users so the image of DOD sitting on a large band of spectrum is something not correct.

Moreover, I would argue that the Nation, indeed the world, reaps an exceptional return on the small amount of spectrum that has been made available at DOD since the U.S. military hopes to underwrite not only the economic security and prosperity of our Nation, but contributes to global, political, and economic stability from which we all benefit. For these reasons, our international peacekeeping and security responsibilities direct comparison of how we allocate spectrum, and how other nations do so are really not comparable.

You may have heard that DOD is not managing spectrum efficiently. I would argue this is not the case. We have crowded several major functions over 100 different systems into the 95 megahertz from 1755 to 1850. We have to justify our continued need for allocated frequencies every 5 years in response to Mr. Whitehead's point, we have to rejustify it. We are investing in spectrum efficient technologies such as the spectrum that allows us to create four satellite channels before we can only use one, and we are investing literally tens of millions of dollars in research and development into finding more efficient spectrum approaches in the future.

With regard to finding spectrum for third generation wireless, we are ready, indeed we are eager to participate with our colleagues in the executive branch, with the Congress, with the FCC and with the private sector to find a selection process that leads to the best allocation for the Nation of this critical resource. The DOD, along

with all Americans, have benefited in the genius provided sector when we expect to do so again, but we have to protect the important national security interests that are at stake in this decision. I hope we can all agree on that point.

As you know, the 1755 to 1850 megahertz band has become a particularly attractive part of the spectrum. Let me explain why this is so important to defense. Consider a pilot in the cockpit of an airplane. He is almost all the navigation, almost all the intelligence support, almost all the communications that he receives comes from one of the more than 120 defense and intelligence community satellites that are controlled within this band.

In addition, the training he has received comes from the frequencies on the air combat maneuvering ranges such as those in Nevada that make our pilots the best in the world. Beneath his wing may be a precision guided missile, the data link for that missile whose military effectiveness and casualties make this so important, resides in this band. Underneath the aircraft is the backbone of the Army and Marine Internet. Tactical Internet, which is becoming so important to our soldiers and Marines, is carried in this band and it provides links to ships overseas. Other important systems including Army's new soldier radios are in this band and there are a number of very critical systems that operate for us here.

Moreover, our demand for spectrum is growing. We forecast a 90 percent increase in mobile spectrum by 2007. If you compare Kosovo to Desert Storm with one-tenth the number of troops in Kosovo, we used just 2 percent of the bandwidth we used in Desert Storm. Within the field from before combat broke out until combat started, spectrum demand increased 21 times, which indicates the burden of combat operations placed on the spectrum. As we move to networkcentric warfare that has spectrum in its core like water for ships and air space for aircraft, this will become even more important. So if a national decision is made that this is the best band, we are prepared to move, but as you pointed out, Mr. Chairman, there are some prerequisites we need to address.

In cooperation with NTIA, we have addressed the possibility of sharing this band. Due to mutual interference, it does not appear that it will be possible to share this band. But to move then, we first of all need to find comparable spectrum. It is not enough just to make a general statement that says somewhere we will find it, all this spectrum is occupied by someone, and we need to identify where we would be moving into.

Comparable technical characteristics are important. For example, the pilot with his munition under his wing. But the data link is increased to a higher frequency. The pilot will have to approach more closely to its target in order to maintain that data. That may put him at risk. Alternatively, you can increase the power to the data link. That may make the aircraft more detectable.

Second, even if comparable spectrum can be found, it appears that that will be late in the next decade before we will be able to vacate, on two reasons. First of all, the satellites I mentioned earlier are on orbit. We have to wait until the constellations fly out, spend an inordinate amount of money, I would argue, to launch new satellites to replace them. The total value of that constellation

is \$100 billion. I honestly cannot believe we would invest in the taxpayers to relaunch satellites in order to retune receivers. Aside from other satellite control, many frequencies dependent on this band may not be available for moving until 2010. This is the time it takes to budget for and field a system like the training system.

We need a mechanism to make sure that the money does in fact arrive at Defense in this compensation. One of the bands, one of the types of frequencies that is been cited that might be relocated is the Army Corps of Engineers fixed point-to-point system. That is true. This system almost certainly could be relocated and perhaps could rely on some of the mobile wireless services that comparable companies are now using. The problem is that moving that function does not free up very much spectrum because it is already sharing the band with the satellites from the air traffic maneuvers. You can move all the fixed frequency out there under wouldn't really free up the spectrum.

So far, we have only addressed what it would take to make the Federal band a feasible option for 3G. The question is even if it is feasible, does it make sense to relocate this band. I would encourage you to ask the commercial sector, are the commercial spectrum needs really well defined? Is additional commercial spectrum available? There is a very, I think, telling bar chart that compares the amount of spectrum available in different countries for third generation services and this shows, for example, in the UK, in Germany, in Japan, there is quite a lot of spectrum that has been made available. It also shows the United States right now in one version of the chart has only 189 megahertz available and that therefore we are somehow disadvantaged. The point, Mr. Chairman, is that actually is more spectrum available in the United States. One calculation is already 228 megahertz available and in about 10 years, as much as 396 megahertz could be made available. Some would be fully compatible with other countries that they have provided on a time phased rollout of this spectrum which we think would match the employment of the commercial systems.

An argument is made on harmonization. If only DOD would move out of this band, then there would be able to get a global 1755 to 1850 megahertz use of this spectrum. That would be very attractive, sir. I will not—it will not occur. China has recently decided that this 100 or so million customers will operate in 2.3 to 2.4. North Africa is looking at 400 to 800 megahertz. Europe is looking at 2.5 gigahertz. There is not going to be a single band for 3G services around the world. The argument is made that if DOD would relocate from this band, it would be easier to operate internationally. There would be sort of a common band from which we could work. The problem is we have already negotiated agreements with the host nations in which we operate to make use of most of our bands. There is an example of an exercise we held in a foreign country where part of the foreign telephone network had to be shut down in order to permit us to exercise. Inconvenient as that may have been overseas, this is exactly the point. The nations that seek our security cooperation have worked with us to find ways to allow our forces to operate in theater and that is the way we continue to work. The problem is when you begin to move one spectrum, it affects a lot of other things.

On the AWACS aircraft, there are over 80 different antennas, so if you retune one of those antennas, it is going to have a ripple effect on all the others so moving one band is not a question of negotiating one agreement overseas.

Mr. Chairman, let me conclude. There have been proposals for a win-win solution in which DOD would receive significant financial compensation to surrender the band and receive the cost of relocating to the other bands. We may be open to other solutions. The concern is moot if we cannot get comparable spectrum. We must find comparable spectrum.

Second, while I am sure these proposals for changes are made in good faith, we have not seen a mechanism by which we can reasonably assure we received compensation beyond the marginal costs after all the various factors of these decisions come into play. To summarize, we could in theory move out of the Federal band, but we need to do it in ways that wouldn't affect national security and the impact would be felt and future missions put at risk, potentially greater casualties to our service members and denial of critical intelligence to national and military decisionmakers. We look forward to this process. Thank you very much.

[The prepared statement of Dr. Wells follows:]

PREPARED STATEMENT OF LINTON WELLS II, ACTING ASSISTANT SECRETARY
OF DEFENSE FOR COMMAND, CONTROL, COMMUNICATIONS AND INTELLIGENCE

1. INTRODUCTION

Thank you, Mr. Chairman, and Members of the subcommittee, for inviting me to speak on this issue of the utmost importance to our military forces, allocating radio frequency (RF) spectrum. As the Acting Assistant Secretary of Defense for Command, Control, Communications and Intelligence, I am responsible for spectrum policy and management within the Department of Defense.

The United States has global security responsibilities and thus has needs for spectrum for military systems that are far greater than any other nation's requirements. This is part of the benefits and burdens that accrue to our Nation, given our worldwide leadership role in the 21st Century. The US Department of Defense must have the resources it needs to carry out these responsibilities.

Spectrum is one of those resources. It is crucial to the success of military operations, which inherently depend on communications and sensing. Satellite intelligence gives us precise data about situations on the ground. We avoid much harm to civilian populations if radio guided bombs precisely hit their targets. Our pilots in the air, soldiers on the ground and sailors at sea are better able to defend themselves if they have real time, effective communications capability. Effective use of spectrum enables us to put fewer American lives at risk during military operations. The transformation of the Defense force structure into a leaner and more agile networked force depends to a large degree on access to adequate spectrum. As the strongest and most effective military worldwide, in large measure because of our use of more sophisticated and simply more spectrum-dependent systems, DoD has unique requirements for spectrum. The safety of our fighting men and women and of civilian populations is at stake.

2. SPECTRUM MANAGEMENT

Managing our national spectrum has become more important as well as more challenging as the demand for spectrum grows. The Department of Defense is committed to managing its allocated spectrum efficiently as well as to working effectively within the national and international regulatory processes to ensure access to adequate spectrum. To this end we are elevating the position of Director of Spectrum Management within the Office of the Secretary of Defense to the Deputy Assistant Secretary level and expanding and enhancing the staff to ensure that all key spectrum management functions are discharged properly. We are also studying options for improving the organization of the Department's Spectrum Management functions overall, and we will make a decision on that in the near future.

Before going into greater substantive detail, it is critical to correct a mis-impression created by certain commercial spectrum users that the Federal Government, in particular DoD, enjoys access to a generous amount of spectrum in the bands under consideration. In fact, it is important to note that of the total amount of spectrum that is generally considered appropriate for 3G deployment today, 700 MHz to 2700 MHz, the federal government is the exclusive occupant of only about 14%.

Regarding national spectrum policy, we think it is important to strike the right balance among competing demands for spectrum, including the right balance between national security and commercial needs. We should remember that, while economic vitality contributes to national security, it is even more true that domestic prosperity depends upon adequate security. Furthermore, domestic prosperity increasingly is tied to global economic health, which depends in large measure on the international security and political stability that the US military helps to ensure.

Under the existing structure for federal spectrum management, Secretary Evans, the Department of Defense and other federal agencies and the FCC, on behalf of commercial users, are currently engaged in the search for spectrum for future commercial and governmental uses, including 3G. The existing structure is intended to ensure that the Nation is making the best possible use of this precious resource and to ensure that there is adequate spectrum both for critical governmental responsibilities, including national security, safety of life and law enforcement functions, and for commercial uses. One of the challenges in managing spectrum is that the value to the Nation of spectrum allocated to vital government services such as national defense and air traffic control—"public goods" in economic terms—is difficult to measure through market mechanisms such as spectrum auctions.

The Department is committed to doing our part in an aggressive process whereby all users of the spectrum, commercial as well as governmental, develop creative solutions to the problems of spectrum scarcity.

In our national efforts to better manage the spectrum resources of the United States, technology also is and will continue to open up new regions of spectrum such as the satellite Ka bands and laser communications. Furthermore, technology is one of the key tools for making better use of available spectrum. Spectrum-efficient technologies such as voice/data multiplexing and sideband filters should be employed wherever possible. The Department of Defense, through Defense Advanced Research Projects Agency (DARPA) programs and other activities, is pursuing advanced technologies for spectrum efficiency aggressively. We have recently received a briefing by DARPA on a "smart" frequency hopping technology that could make available unused spectrum in both government and commercial bands. Realizing the full benefits of some of the new technologies will require regulatory changes.

3. FINDING SPECTRUM FOR THIRD GENERATION WIRELESS

The issue of finding spectrum in the United States for Third Generation Wireless ("3G") services illustrates the growing demand for spectrum in both the commercial and government sectors. The Department of Defense's needs for spectrum are growing along with those of other organizations. For example, the satellite bandwidth used in Operation Allied Force in Kosovo was two-and-one-half-times the bandwidth used in Desert Storm 9 years earlier, while the Kosovo force was one-tenth the size. Work done at the Department of Defense has projected significant growth in military spectrum requirements in all functional areas over the next few years (see Figure 1).

Access to adequate spectrum was critical to US Forces' success in Desert Storm and Kosovo and will continue to be crucial to the Department's ability to transform itself into a leaner, more agile, and more effective force that can meet the security challenges of the future at reasonable cost to the taxpayers. Fundamental to this transformation is the network-centric concept of operations which is already being implemented. In this concept, all elements of a joint force are connected by a robust information network that enables common situational awareness and collaboration. Spectrum is virtually the only way to connect mobile ground forces, ships, aircraft, and satellites.

4. DOD USE OF THE FEDERAL GOVERNMENT 1755–1850 MHZ BAND

As you know, the Federal Government band from 1755–1850 MHz is one of the bands under consideration for 3G. DoD uses this band for satellite control, battle-field radio relay, aircrew combat training, precision weapons guidance, and many other important functions. The band was picked for these functions because the signals at these frequencies propagate in ways that make the spectrum ideal for mobile communications. Altogether more than 100 DoD systems, and a more than equal number of systems from other Federal agencies, utilize this band. Figure 2 depicts

many of the uses. I will briefly describe each of the major functions resident in the 1755 MHz band.

The control uplinks for all DoD and Intelligence Community satellites (more than 120 satellites representing a cumulative investment of about \$100B) use the 1755 MHz band. These satellites perform communications, positioning and timing, surveillance and reconnaissance, weather observation, and other functions crucial to warfighting and to decision-making by National Command authorities, including the President, the Secretary of Defense, and the Chairman of the Joint Chiefs of Staff, as well as other senior military decisionmakers.

DoD's Global Positioning System satellites have become crucial parts of the national civilian/military infrastructure supporting global navigation and positioning requirements for air, land and sea vessels. GPS serves functions that are as important as the functions provided by railroads and telecommunications systems.

The battlefield radio relay systems in this band form the long-haul backbone of the Army and Marine tactical Internets. They let our ground forces share situational awareness and coordinate their operations in real time across the extended battlefield, as well as to ships off-shore.

The Air Force and Navy aircrew combat training system, which provides realistic training with engagement assessment and feedback, is one of the main reasons American pilots are the best-trained combat pilots in the world.

The most accurate air-launched precision weapons in the Services' inventories are guided by data links using this Federal band. These weapons are often used by commanders to ensure the highest probability of mission accomplishment with the fewest possible civilian casualties.

Virtually all of these systems played a key role in the Allied victory in Kosovo. The success of this operation would have been unlikely without satellite-based communications, navigation, and reconnaissance, without well-trained combat aircrews, without precision-guided weapons, and without tactical radio relay systems.

Other important DoD systems that use the Federal band include Combat Identification, soldier radios, and weapon scoring.

In an era of smaller force structure, fewer people, and increased mission responsibilities, these systems provide essential training and operational capabilities. The payoff is realized in terms of mission success and force protection across the full range of US military operations from combat to peacekeeping and humanitarian operations.

I want to say in the most unequivocal way possible that *the loss or degradation of our ability to perform the crucial functions that currently depend on this Federal band would have very severe consequences for national security. It would result in mission failures and increased casualties in future operations, and loss of vital intelligence information to the President and senior leaders.* If 1755 MHz–1850 MHz is to be reallocated, then other suitable spectrum must be found to enable the essential military functions to be performed without degradation, and we need enough time to relocate to the new spectrum.

5. DOD STUDY FINDINGS

The White House-directed study conducted by DoD on accommodating 3G services in the Federal band examined the options of sharing the band, vacating all of the band, or vacating part of it. The study found that sharing the band between 3G services and incumbent DoD systems would not be feasible because there would be too much mutual interference. Vacating or segmenting the band is feasible in theory, provided that comparable spectrum could be allocated to DoD and adequate, timely financial compensation provided. However, the DoD study found that DoD satellite control systems might not be able to vacate the band before 2017 and non-space systems before 2010. These timelines are driven by fact-of-life considerations including the expected satellite lifetimes, the inability to change the frequencies of on-orbit satellites and time required to design and field new systems in a different frequency band. NTIA's report incorporates the DoD findings.

6. COMPARABLE SPECTRUM.

Let me emphasize again, as a matter of national defense and security, DoD's ability to carry out its operational mission will be jeopardized if the Department is not provided with access to spectrum with appropriate technical characteristics and regulatory protections. The National Defense Authorization Act of 2000 requires that DoD be provided "comparable spectrum" for functions displaced by reallocation of Federal spectrum to meet commercial needs. The Secretary of Defense, the Chairman of the Joint Chiefs of Staff, and the Secretary of Commerce must jointly certify that any replacement spectrum is comparable. We consider this to mean that the

replacement spectrum for different DoD systems has suitable technical characteristics and similar regulatory status so that the displaced function can be performed with no degradation in essential military capability.

The process of identifying comparable spectrum is ongoing. Forced relocation of DoD without provision of equivalent spectrum will result in the very severe consequences to National Security that I addressed earlier. We will continue to work with all parties to find a way ahead on spectrum for 3G. Nonetheless, we believe that the issue of equivalent spectrum must be resolved in tandem with the decision making process.

7. CTIA PROPOSALS

In their 3G “briefing book,” CTIA has proposed work-arounds for satellite control, tactical radio relay, and air combat training systems to enable accommodation of 3G services in the Federal band earlier than the DoD timelines. Our initial assessment is that none of these proposals could be implemented without serious degradation to DoD capabilities. CTIA has not proposed work-arounds for precision guided weapons or many other important DoD systems.

CTIA has proposed a “win-win” solution in which DoD would be provided modernization funds, beyond the marginal cost to relocate, as an inducement to accept relocation. We would be interested in seeing what could be included in such a package but have not yet seen such a proposal. Moreover, we emphasize that any such solution could only be viable if DoD is provided access to spectrum with equivalent technical characteristics and regulatory status, and if we are allowed sufficient time to relocate to the new spectrum if it can be found.

8. NEED FOR ADDITIONAL SPECTRUM FOR 3G IN THE UNITED STATES

While the World Radiocommunication Conference of 2000 identified a need for an additional 160 MHz of spectrum for 3G, there is reasonable doubt about whether this assessment is valid for the United States and uncertainty about the timeline for meeting any additional needs. We believe that the spectrum needs of the US wireless mobile industry should be updated and refined and timelines for such spectrum spelled out. The US has a much lower population density than Europe or Asia, so that requirements for 3G personal communications devices may be smaller than either of these regions. Further, we can expect that technological advances will enable the wireless industry to wring more use out of their spectrum (just as the DoD is counting on spectrum-efficient technologies to enable us to meet our growing needs without demanding more spectrum from the regulators). Finally, the amount of spectrum needed for 3G is undetermined because the demand for 3G services is unknown at this point. Many industry observers believe that second generation wireless services (“personal communications services” or PCS in the United States), with enhancements (high speed voice and data connection, but not streaming video) will be sufficient for most truly mobile users.

9. CANDIDATE BANDS FOR 3G

The Federal 1755 MHz band is heavily encumbered and would require nearly two decades to become available. There are other bands readily available to FCC for meeting the needs of the 3G vendors. Figure 3 lists some of the other bands available. Some of this spectrum was reallocated from DoD/Federal use to commercial use by earlier legislation and NTIA action but it has not yet been made available through auction by the FCC. Altogether there is at least 130 MHz of suitable commercial spectrum that FCC could make available this year with limited displacement to established users, and more than 240 MHz could be available within ten years.

Another means of meeting the 3G spectrum requirement in full or in part is to provide 3G services on spectrum currently used for PCS or other wireless services, as FCC regulatory flexibility allows and as some 3G vendors are planning.

10. HARMONIZATION

CTIA argues that the Federal band is desired for 3G because it would harmonize US spectrum allocation with 3G allocations around the world, facilitating global roaming and cost savings due to economies of scale. However, there are at least six bands that WARC-92 and WRC-00 suggested nations consider for 3G. *Worldwide spectrum harmonization of 3G bands will be difficult, if not impossible, to achieve and it is generally agreed that future mobile terminals will need to be both multi-mode and multi-band to meet the global roaming requirement.* Many nations are still considering which bands will be used for 3G, and I am not aware of any nation that

has auctioned the 1755 MHz band for 3G. In fact, Europe uses the 1755–1850 MHz band for 2G. Europe would need to make regulatory changes before using this spectrum for 3G and probably will not migrate it to 3G for more than a decade, if ever. Many nations are waiting to see which band the US picks.

Within the 2G market today there is a lack of spectrum harmonization, but global roaming is enabled by tri-band/tri-mode terminals that are *available today*. In addition, the terminal and the usage costs are well within reach of most consumers. With the advent of new technology, multi-band and multi-mode terminals probably will be even cheaper to produce in the future. As a result, we believe that, not only is international wireless bands unlikely to be achieved, but also it is not required to enable affordable global roaming.

The United States' long-standing strategy at the ITU has been to generally oppose setting of mandatory standards or allocating spectrum for specific systems within the broader service allocations. This strategy was developed to further the national interest, largely because of US policies intended to protect national sovereignty over telecommunications and to provide for market-driven innovation and competition by keeping radio services as flexible as possible. There, of course, are exceptions to this US strategy, most notably for global systems, such as the global mobile personal communications systems and global positioning systems such as GPS and Galileo. The Department has fully supported these national decisions.

At WARC-92, the United States opposed "allocation" or "reservation" of spectrum for the Future Public Land Mobile Telecommunications Systems (FPLMTS), the original name for IMT-2000. The US ultimately agreed to a compromise of only non-binding "identification of spectrum" for FPLMTS. Subsequent to WARC-92, the FCC took action to make spectrum available for PCS services that substantially overlapped with the spectrum identified for 3G. By making this decision, the FCC decided that there were national interests more important than supporting worldwide "harmonization" of wireless mobile services. There have been great benefits to US consumers from this decision since there are millions of PCS users today in the US and many other countries but, as yet, there are no commercial 3G mobile operations in the bands identified for FPLMTS by WARC-92.

Therefore, while spectrum harmonization should be considered along with other solutions to allow services to be more available and affordable to the consumer worldwide, it should not have an overriding priority when these services can be met at an affordable cost using existing as well as future technological solutions.

11. THE FEDERAL GOVERNMENT, INCLUDING DOD, IS MANAGING SPECTRUM JUDICIOUSLY

DoD is not "hoarding" spectrum nor using it inefficiently. DoD is granted access to spectrum by NTIA and, in a few cases, by FCC for specific purposes. The need for government spectrum for particular users and uses is reevaluated on an ongoing basis. DoD systems must be designed to a very high level of spectrum efficiency since the lives of servicemen and women are at risk and many military systems must operate in close proximity at the same time, during military operations. We are constantly pursuing new spectrum-efficient technologies. For example, we are fielding multiplexers for our UHF satellite receivers that multiply the number of channels per satellite by a factor of four. Moreover, we believe that the fact that some 100+ DoD systems—and systems of several other agencies, including the Departments of Justice, Agriculture, and Treasury and the National Aeronautics and Space Administration—make use of the 1755–1850 band for numerous important governmental functions illustrates the Federal Government's efficient use of this band.

I would like to emphasize again the relative allocation of bandwidth between industry and the Federal Government. Out of the total amount of spectrum that is appropriate for 3G deployment, generally 700MHz–2700MHz, the Federal Government is the exclusive occupant of about 14%.

12. CONCLUSION

The issue of finding additional spectrum for wireless communications requires a balancing of economic and national security needs. We should remember that there can be no economic prosperity without national security. Furthermore, the value of national security cannot be measured in dollars. The benefits the Nation derives from making spectrum available for Defense are expressed in terms of wars that we won't have to fight, and victories achieved and casualties avoided in the wars we do fight.

To summarize the DoD position on this issue, we must have comparable spectrum if we are to relocate, and this should be identified and certified as we make any decision to reallocate the Federal band. Forced relocation of essential military func-

tions without comparable spectrum or without respect for the transition timelines would cause serious damage to National Security which would be reflected in increased casualties and mission failures, as well as reduced intelligence to our national and military leaders.

However, we remain open to considering a solution that genuinely benefits DoD as well as industry if such a solution can be found. The way ahead is for all of us to work together to further assess what band options are feasible and, of the feasible set, which is the best choice for 3G based on mutually-agreed criteria. This process must include an attempt to identify and certify comparable spectrum for DoD if FCC still wishes to consider the Federal band.

In conclusion, while we continue to have some serious concerns, we are confident that by working together we can achieve a long-term solution that will protect both our national security and our global leadership in commerce and technology.

Senator INOUE. We have just been notified that we have 3 minutes left to vote, and so we will stand in recess for 10 minutes.

[Recess.]

Senator INOUE. We will resume our hearings. May I begin with Dr. Wells. I realize that the GAO has not completed its report. However, they have issued a draft report indicating that they would like to have more time to study this matter in greater detail. Notwithstanding that, I'd like to see if you can give us some enlightenment, information. If you are required to relocate, how much spectrum would you need? Do you have any idea?

Dr. WELLS. We have 95 megahertz. A lot of it, and my first answer would probably be about the same amount, subject to we need to sit down and look at could you define functions and stuff like that. For example, there has been discussion of moving some of the satellite control frequencies higher up into what's called the unified S-band. That might be possible again in some time with the—when you can launch new satellites in those frequencies.

The problem is that that band is already crowded, and there is regulatory protections. For example, NASA now operates in that band. A newscaster can go out and report back from the field. Obviously you couldn't operate an intelligence satellite under those circumstances, so we would be willing to look at the unified S-band and see if you can compress some of the satellite frequencies. I cannot tell you whether it is one-to-one. It is about 95 megahertz subject to some adjustments.

Senator INOUE. What you are telling us is you have not yet identified any spectrum available to you?

Dr. WELLS. Within the government bands, there do not appear to be any bands available. We agree with NTIA on that. The question is commercial bands, that begins a negotiating process that we are not able to decide by ourselves.

Senator INOUE. Many of us on this Subcommittee are members of the Defense Appropriations Subcommittee, so we are well aware of the investment we have made. A lot of money. Now, if you are required to move, how much would it cost?

Dr. WELLS. The—

Senator INOUE. Do you have any idea?

Dr. WELLS. I cannot tell you precisely, sir. Some of the preliminary estimates that came in I believe were quite low because they did not consider time lines. For example, if someone wants us to move out of the satellite band early, one is going to have to build and launch replacement satellites which is going to be a pretty expensive proposition, so we are now looking at what it would take

under different timelines. We need to be out by 2008. What does that mean in terms of developing the system instead of letting the old one die? I am reluctant to give you figures right now.

Senator INOUE. Will you provide the Subcommittee with a response that is in much greater depth on the use of your spectrum efficiently, because there have been those who have suggested that DOD is not using its spectrum efficiently.

Dr. WELLS. I would be glad to do that.

Senator INOUE. I thank you very much. Mr. Knapp, we have testimony that will be presented later which will suggest that we may not need additional spectrum because the present spectrum use is not efficient. What is your assessment?

Mr. KNAPP. One of the cornerstones of the Commission's policy has been to provide flexibility within the existing spectrum bands that are used by PCS, cellular and the specialized mobile radio service, and there really have been advances in spectrum efficiency through the years as a result of that policy. We are already hearing that the major cellular carriers and PCS carriers have announced that they are going to begin as a result of our flexible policies to offer 3G services within the existing spectrum. The real issue is as those services grow and there are more users and more extensive use of data services, that the capacity will need to increase down the road.

So I think the Commission's overall view is that there is a need for additional spectrum. The real question is the amount and where.

Senator INOUE. If I may, I'd like to ask the same question I asked Dr. Wells. Have you been able to identify any spectrum that may be made available to DOD if the move is required?

Mr. KNAPP. If a move is required there are additional bands in this region, but I would stipulate, as a starting point that all of the spectrum is crowded and shifting things around is always difficult. But there may be other bands in this region that are worth looking at that may help solve the relocation problems.

Senator INOUE. Ninety-five?

Mr. KNAPP. I do not know that it would total up to 95, but part of that exercise would involve looking at whether you could repack or shrink some of the use into smaller bands, and it may be able to be done in small pieces, rather than one contiguous block.

Senator INOUE. How would you suggest the DOD be reimbursed if such a thing is necessary?

Mr. KNAPP. Well, under the current legislation, DOD is required to be reimbursed for any relocation that is necessary, and—

Senator INOUE. Should it come out of the auction fee?

Mr. KNAPP. I do not know if that is the Commission's issue to address. And to the extent that it may help relocation, that may be something to look at.

Senator INOUE. Do you have any thoughts, Mr. Hatch?

Mr. HATCH. Thank you, Mr. Chairman. In our study, we did look at some, one commercial band that Dr. Wells had just alluded to, the 2025, 2110 is a potential band for the satellite links. We looked at three other government frequency bands. Only one of those frequency bands was below three gigahertz. The other frequency bands were above three gigahertz and it would appear that we

could accommodate the fixed systems in those frequency bands, but it does not appear that we in the government spectrum would be able to identify enough comparable spectrum to satisfy the DOD requirements.

Relative to reimbursement, the legislation is now as you know, the costs would be paid by the winning bidder, in addition to the prices bid on the spectrum. There have been proposals and industry has certainly talked about having the proceeds come out of the auction receipts, and that is something that I think certainly warrants further discussion. Thank you, Mr. Chairman.

Senator INOUE. So, Mr. Hatch, it is your view that at this moment you are not aware of comparable spectrum that can be made available to DOD?

Mr. HATCH. Basically that is true. Yes, sir. We have looked at the government exclusive spectrum to see if we could accommodate all the requirements there, and we need to do a more detailed analysis when we determine if the spectrum is going to be given up, and how much to determine how much additional spectrum would be needed. Right now the spectrum that we have available to us does not appear to be sufficient to accommodate all of their requirements.

Senator INOUE. Dr. Wells, if the move is required, how long would it take?

Dr. WELLS. Some things might be fixed system, like was referred to, can move through fairly quickly. The problem is that since other systems overlap, that moving that fixed system would not gain you any spectrum because the satellite frequencies we estimate would take into 2017 to fly out the existing constellations and begin launching systems with other bands. The fixed systems is 2010, actually 8 years from whatever year the money begins to be appropriated because you have to, in research and development, you have to build the systems, you have to test and field them and to do something like air-to-combat maneuvering ranges takes a long time. 2010 is what we are saying for professional systems, 2017 for satellite.

Senator INOUE. From your responses, am I to conclude that it is the view of DOD that now is not the time to make a firm decision? That we must wait a little while?

Dr. WELLS. I believe we need to explore other options, Mr. Chairman.

Senator INOUE. Thank you very much.

Senator Burns.

Senator BURNS. Thank you, Mr. Chairman. You covered most of the questions that I had on my list. I would ask Dr. Wells, it is hard to forecast anything in government on how long it is going to take to make the move or how much it is going to cost. My question is, how long do you think it would take you to develop the planning process of doing such an exercise?

Dr. WELLS. I believe that could be done fairly quickly. In fact, we met with Mr. Hatch and with the FCC last week to begin talking about an accelerated process to put on the table. As many options as need to be done to find the best national solution of this.

Senator BURNS. Do you have a working group within DOD that tends to monitor spectrum and how it is used and how much you

have got on the shelf and have all that information available to you almost at your fingertip?

Dr. WELLS. We do. We also, as I mentioned, we are increasing the management visibility into this by creating the new frequency for data spectrum management.

Senator BURNS. I am not trying to lead us down the road of saying the only possibility that we have in developing 3G is the spectrum now being used by the Department of Defense. There is a lot of us who think we have a great Department of Defense and we think it is very critical to the security of this country, and we leave it to you fellas or the folks at DOD to assess that, and to give us a pretty realistic assessment of what it is going to take to carry out your national security mission.

I would say, and I would ask the panel if we would disallow any other allocation of spectrum, and with the information that we have got that we are not using what we have a while ago what the Chairman alluded to, that we are not using the spectrum as efficiently as we could on what has already been allocated, what will happen to our R&D on the development of using a spectrum more efficiently? In other words, putting more on the same road as we have now? And Mr. Knapp, I would ask you that.

Mr. KNAPP. The use will always fill out the available space. So when there is a smaller amount of spectrum, it tends to drive, as long as you provide flexibility, advancements in spectrum efficiency. So there is a tension there between the amount of spectrum and the pressure to develop more advanced technology, more spectrum efficient technology.

Senator BURNS. Mr. Hatch, what's your assessment?

Mr. HATCH. Thank you, Senator. I think that we have to look at all the options that are on the table for the various spectrum that can be made available. I think we have to look at these new efficient technologies that we are all hearing about to see how efficiently they will make use of the spectrum and try to make the best determination on the amount of spectrum that is available as well as the technical characteristics we should try and use.

Senator BURNS. We have seen a study that is in progress now that will be completed in November on the assessment of how we approach spectrum management reform. And it is like I alluded to in my opening statement, I believe if you thought there were a lot of moving parts in the 1996 Telco Act, there will be a lot of moving parts as we move down that highway of recommending the way we manage our spectrum. So I look forward to working with each and every one of you, but I do not want to just hurry and put together a piece of legislation in haste and get everybody, everybody in the dust, so to speak, and not have a lot of information that we are going to need or answers to questions that we are going to need before we complete the exercise. And I think we can work satisfactorily through this. I look forward to working with you, and I look forward to cooperating with you also as we tend to look at this big issue. I thank you for coming today. I thank you for your testimony.

Senator INOUE. Thank you very much.

Senator Stevens.

Senator STEVENS. Thank you very much. Let me ask you, Dr. Wells, suppose we just told you that you had to use 30 percent less spectrum within 2 years. Could you do that?

Dr. WELLS. I believe we would be putting our people at serious risk by doing that. I believe we can migrate over time. I believe there is a way ahead in a national approach to the problem. I believe a precipitous approach is going to cause problems.

Senator STEVENS. Have you ever analyzed to see how much the Department of Defense's spectrum use could be provided by the private sector on a contract basis?

Dr. WELLS. We have actually looked at commercial adjuncts to Department of Defense communications, for example, satellite communications, for example, using cellular telephones in lieu of mobile radios, and honestly, I have gone into this on several occasions thinking that would be a fabulous opportunity to do. This unfortunately, sir, we have been disappointed every time. We are about to go and look at this again. For example, some of the things we need are builders which are not part of the commercial need. We need security which is increasingly able to be provided by sleeves. One of the things I find very attractive about third generation is we have to work in a network world netted together, and really conference calling by a cell phone is not at the same level as military network radios. We are hoping that 3G will help bring that capability to us as well. Thus far it has been slower than we would hope.

Senator STEVENS. I don't think there is any stronger supporter of the Department of Defense than the two of us, however, we know the redundancies are in your systems. Have you ever looked to see if you must maintain those redundancies in the training and operational efficiencies of the department?

Dr. WELLS. The fixed mode, the fixed point-to-point is something that could move. I think that, I will take for the record the question about training because if anything, our training is becoming more network intensive as we go to this networkcentric warfare. We are increasingly able to make use of simulators, for example, which allows people to train without getting in the cockpits, without getting in the tanks. The Army is moving to digitized force. Navy is moving to netcentric warfare. Let me take that for the record and get you a balanced phrase. It is not as easy to cut the spectrum as one would expect.

Senator STEVENS. I hope you do. We have to defend you somewhere down the line, and I would like to make sure we are starting from the point that is defensible. People start coming up with some facts here that I think could be brought up in terms of the redundancy and the excess use of communications and spectrum, I think we are going to be in trouble.

I do not think that the department has gone to the point of multiple use of existing spectrum that the private sector has. I do not know if that is cost or otherwise. I hope you will analyze it.

Dr. WELLS. I would also like to send someone over to meet with your staff to find the specifics that cause you concern, and we will address it particularly.

Senator STEVENS. Let me ask another question. As I listened to the testimony of the three of you, I am not sure we are in total

agreement on the facts. Do you all agree on the facts of the total allocations and how they have been made and the basic necessity for Defense to have the spectrum it has now? Do you agree, Mr. Hatch?

Mr. HATCH. Thank you, Senator. We have in fact reviewed the systems that are in the 17—actually the 1710 to 1755, although we have given up the 1710, the 1755 megahertz spectrum. There are protective sites in there for the DOD so their spector of use remains and looked at the 1755 to 1850 and we have asked some questions of the DOD of the total spectrum that they needed for some of those systems. They are in the process now of obtaining that information and providing that to us, so I do not have a complete answer. I will be glad to provide it.

Senator STEVENS. I asked the question because from a generational point of view, if you go back to the days of early allocation spectrum, it was on a much broader basis and less specific than it is now. The assignments over space now, I do not know how the department can say that the space it got, allocation it got in terms of spectrum 30 and 40 years ago is absolutely necessary now unless it can show that it is using that spectrum in the very modern sense of digital allocation.

Have you examined that, Dr. Wells?

Dr. WELLS. We have given up since 1993 240 megahertz of spectrum. We are adjusting some of our frequency use based on that loss. There is a program called a joint tactical radio system, which I think is a very constructive example. This is what we look at the future of our tactical communication systems, and what we did was we went to industry and said if you would develop a software radio standard, standard for software programmable radio, technically change the radio with a card, but do it in software. We would build a system around that commercial standard and you, industry, could use that standard in the future. That program I believe is going to be sort of the wave of the future and represents an industry partnership that is not only going to be good for them, but also good for us and much more efficient in the use of spectrum.

One of the other things we are looking at is so-called adaptive antennas. It samples the frequency and says that somebody is on this, can I hop to another unused frequency and transmit there, when that gets crowded, hop back to another. So that is the kind of research that is in place. We have in the test range community alone, \$50 million worth of research and development in the next few years, and we have to ensure the best allocation of that spectrum.

Senator STEVENS. If you are sitting on spectrum if it was looked at from the point of view of recent sales of spectrum, it is worth trillions of dollars. I hope you keep that in mind.

Dr. WELLS. We will.

Senator STEVENS. Mr. Knapp, what's the position of FCC about allocations that are there in the Defense side? You really do not analyze that, do you?

Mr. KNAPP. No. We do not, Senator.

Senator STEVENS. I would hope that somehow or other, we would find some way to get a level playing field here in terms of the adaptation of the most up-to-date technology for the Department of De-

fense and see what needs, to totally digitize, totally utilizing up-to-date and most modern capability, we have to take the full advantage of this spectrum.

Dr. Wells, I remember too well when I was in those planes in World War II, we would crank them two degrees this way. We would end up at the point in the middle. Everything was protected by at least two extra points on the spectrum. If you eliminate, have you eliminated all of that now and gone to digital use of your spectrum?

Dr. WELLS. One of the problems we have are the mega C systems that are out there. We are moving toward the joint system we mentioned is going to be the most modern frequency allocation in the world. We have numbers of systems. The Secretary just went out to Omaha, Nebraska to visit the commander of the strategic command and he was looking at some of the radios in those airplanes which date from the 1970s and 1980s and we have to work through those old systems before I can tell you we have everything that is as digitally controlled as we would like to have.

Senator STEVENS. I remind the Subcommittee of this but when I came here the Senate controlled Army communications to Alaska. It was just twisted wire put up by Mitchell, as a matter of fact. We have totally modern communications and we have more penetration of this world per capita in our State than anywhere in the country, because we are no longer under that system, Dr. Wells. And we took full advantage of the development of new technologies that came along because of economics of it, and not because we just were entitled to it. I really think there is no economic pressure on the Department of Defense, and I wish there was some way we could work that out.

I would like to point out, as the Chairman has hinted, if you can find more spectrum available to sell, we will give you the money. I think the thing to do is get the spectrum. The money is immaterial to us right now.

Dr. WELLS. Absolutely. We need to find the common spectrum to move into. Also, Senator, we are desperately seeking the best ways to use them. We forecasted 90 percent growth in our demand for mobile services in the next 5 or 6 years. We are in Kosovo, we experienced 21 times increase in the use of bandwidth and the only way we could fight that war was by commercial leasing. We could not do it with the available equipment in the Department of Defense. We have got to do this as public private partnership, and we have got to squeeze the absolute most out of our spectrum because we are moving the network concept. The Secretary is doing the Quadrennial Defense Review looking ahead. Central is the area of space information and intelligence and how we share knowledge, how we build shared awareness, how we synchronize our forces. That only happens through the use of radio frequency spectrum.

Senator INOUE. Senator Wyden.

Senator WYDEN. Thank you, Mr. Chairman. I will say, listening to Senator Stevens was well worth waiting for because I think Senator Stevens, and you, Mr. Chairman, and Senator Burns have all put your hands on it. The name of the game is figuring out ways to get these technologies that increase efficiency. That is the single most important thing. I am glad that you, Mr. Chairman, and you,

Senator Stevens, are going to be leading this on the military side. You are going to have my full support in this effort.

As far as the civilian side is concerned, I think the problem is again that on the civilian side, we have insufficient financial incentives for the development of creative technologies that improve efficiency. Pin down for me, if you would, Mr. Knapp, how much of the privately-held spectrum is currently subject to the kind of flexibility which you have testified today actually increases innovation?

Mr. KNAPP. Senator, I would like to get back to you with precise amounts, but particularly through the 1990s as new spectrum was allocated, whether it was for PCS, wireless communication services and so forth, we have largely been assigning licenses that have flexibility as to the service that you use, the technology that you use, and of course, the licenses are assigned through competitive bidding.

Senator WYDEN. As of today, is it not correct to say that the amount of spectrum on the private side that is open to some flexibility and marketplace forces is under 20 percent today?

Mr. KNAPP. I do not know the exact percentage. We have been moving toward, recall, of course, that part of it is allocated for things like public safety and private mobile use, and even there where we did not have market forces in place, we had mandatory rules that forced efficiency.

Senator WYDEN. I just think the Chairman, and I have talked with him about it, is very motivated in the right direction here. But when I look at the civilian side, I say to my colleagues, what we are doing at this point is we are going to have a proceeding, have another proceeding, have another proceeding, and a motion for a proceeding, and my sense is at the end of 3 or 5 years, if we do not speed this up, and inject some real marketplace forces, the world is not going to look all that much different on the civilian side. I see you are nodding your head firmly, Mr. Knapp. I probably ought to quit while I am ahead.

Mr. KNAPP. The Commission, I think, would generally agree with you. We need to bring market forces to bear to spectrum management. We have been looking at things to increasingly do that, such as our initiative on secondary markets.

Senator WYDEN. Mr. Hatch, for a government spectrum user today, what are the incentives to economize on the use of spectrum?

Mr. HATCH. Thank you, Senator. We are constantly reviewing the technical standards for our systems in the mobile area we have required government agencies to go to narrow banding. We have trunking systems that we require them to use common trunking systems within the same general geographical area. On our radio location and radio navigation systems which are very high power and have been notorious for causing energy to be in adjacent bands, we are continually looking with industry to update our technical standards and try to improve the efficiency of those radar so that they will use the spectrum more efficiently and not cause interference in the adjacent bands.

Senator WYDEN. Those are all good works. There is no doubting at this chair about your desire to do good works, but what are the actual reasons why someone would relinquish or share excess spec-

trum right now? What troubles me, folks, is I think we are going to keep repeating this 3G battle year after year unless we retool the system and Senator Stevens and the Chairman talked about some of the efforts they are going to make on the military side. This Subcommittee has jurisdiction on the civilian side. I want to make sure we get down on the record that the system is the problem. It is not the motivations that you see, which I consider to be very good and in the best interests to serve the public. Mr. Hatch, you gave me some examples of good works. But on the question of what incentives there are to economize with respect to spectrum, I do not see it. Maybe I can continue on more with this.

Mr. HATCH. Thank you, Senator. We do have, as Dr. Wells has pointed out, our 5-year review cycle where we do review every assignment through all the government agencies to see the necessity for using the spectrum. We are running short of spectrum to satisfy our requirements the same as the private sector, and there is the same incentives there to use more efficient technology because there is no more spectrum. We have constant requirements coming in from the private sector to share spectrum with government users, and we have come up with some very innovative ways to use this spectrum more efficiently and share with the private sector. One of those new ways was to look at time sharing between our mobile satellite, between the private sector mobile satellite systems and our space research type of satellite systems where we were not in view all the time and we are not using that spectrum during certain times or in certain geographical areas. The private sector had satellites and we are now coordinating all of our satellite information and data to allow those systems to share both geographically and in time in order to use that spectrum more efficiently. So I think there are incentives out there to try and keep using the spectrum more efficiently and ensure that we are, as Dr. Wells has said, good stewards of the spectrum and are continually using it more efficiently.

Senator WYDEN. Well, I have to tell you that I am skeptical of that point. It has nothing to do with your intentions. I am glad that Senator Stevens and the Chairman are going to be looking for ways to continually push development of technologies on the military front. I am going to do it on the civilian side. I think this system is a dinosaur. I think it is right out of "Jurassic Park," and part of what has happened politically, and you see it in discussion with the broadcasters and the like, is that any time anybody talks about a little bit of flexibility, everybody goes into a defensive crouch. I understand that. I mean, we have got to meet our national security needs.

Fortunately, we have the Chairman and Ranking Minority Member who are going to do that. But it is the system that is skewed in my view away from innovation. On the marketplace side, it does not do enough to look at the next exciting opportunities for wireless. The Internet is going to be wireless. We all understand that potential. And we need to do more on the military side. So I thank you, Mr. Chairman, Senator Stevens, Senator Burns have said it so will. I look forward very much to working with you, Senator Stevens, Senator Burns on this because this is about creating incentives for efficiency. It is harder to make spectrum fall out of the

air. We certainly should figure out more ways to make it attractive. I thank you.

Senator INOUE. Senator Brownback.

Senator BROWNBACK. Mr. Chairman, I think it has been an excellent panel and a good discussion here. First, maybe to put a real time issue on it, industry people I have been talking to say that within the next 18 to 24 months we are going to have extensive amounts apparently of dropped calls, incomplete calls, problems that are going to be taking place because of a lack of spectrum in some of our most critical urban markets. So we have got a tight timeframe that we are talking about here, and I think what Senator Wyden and others are pointing out, along with the Chairman, Ted and Conrad, are that we need to start working on constructive solutions and press forward.

Dr. Wells, I was concerned, one of your points at the end, and I am sorry I missed the first part of your testimony. But at the end you were saying we are waiting for the win-win solution to come to us, and for people to approach us about this. We want to do a win-win solution, but we do not see it. It sounded as if in your presentation that you are waiting for it to be presented to you. And I am really hopeful that what you are doing is searching internally to try and find what that is. You know best your system and you know the national security needs and you also know the pressures. But if you have got people this supportive of the Armed Services pressing too, we need to get some of this spectrum out in the private sector, and it is not coming forth, that is just going to build more and more pressure and there will be legislative solutions being put forward that really ought to come from you internally. Because that is where we would feel most confident and comfortable. But if the calls start getting dropped, if we are not having sufficient spectrum to meet the demands of the public, and it appears that there are some potential solutions that await internally, then the legislative solutions start coming forward, so I would just plead with you and press you to work internally to develop those win-win situations and to present those as options exteriorwise in these negotiations, and we do not have a lot of time to get this done. If you would care to respond either to the timeframe or the work internally, I would appreciate it.

Dr. WELLS. Let me assure you, Senator, we are searching aggressively in searching for these win-win options. The department is literally eager to work with my colleagues at NTIA and FCC, private sector economy to find a way ahead of this. This is not a matter of national security. The overall economic health of the country is a matter of national security as well, and we recognize the importance of wireless services to the future of that economy. So we are looking to be not just sort of hoarders of the spectrum that we have, we are looking at being efficient users of what we need but making sure at the same time that the national security functions we need to perform are performed. That is going to cause us to find ways to reach out. That is going to—we will be meeting here in the next few days, weeks with NTT, FCC and NTIA to find ways to put on the table all the options which may include some of our options as well of ways ahead. We know it is not going to go away. We know that we need a national solution that weighs all the factors.

Senator BROWNBACK. When we start getting millions of phone calls dropped, incomplete, other things because of the lack of spectrum, there is going to be a lot of pressure building here, and that time is just not that far away from us.

Dr. WELLS. If I could just make one reference, one of the things that operates in this band in terms of control frequencies is the global positioning system which most people do not think of as a military system, but in fact grew out of the military. That has become such a critical infrastructure for the Nation as a whole that as we find a way ahead to migrate these satellites, it is not just military. We have to make sure that those frequencies are protected for the civil community as well.

Senator BROWNBACK. I appreciate you being here and hearing this message from some of your strongest supporters. I am a strong supporter of the military as well. We have got to find these solutions if at all possible. We need to do so really within the next several months if we are going to get this to happen in a sequence such that we do not bump up against a lot of problems in some of the major markets in this country.

Senator STEVENS. Mr. Chairman, could I ask just one more question. I have been thinking about creating legislation to create a fund into which moneys would be paid from those who would lease—with leased spectrum from the Department of Defense or from those in the private sector that have spectrum, accelerate approval of that, Mr. Knapp, in the private sector so that we could have some joint use or multiple use of some of the spectrums up there now, particularly the spectrum that DOD might not currently need, some sort of a lease, sublease with an instant recall concept for the Defense spectrum, something that would meet what Senator Brownback is talking about right now. The absolute prediction of shortage we had at one meeting of this Subcommittee indicated that we are falling behind internationally because of the shortage of spectrum.

If we did that so the Department of Defense could use that money to proceed to digitize and upgrade your communication, and so the FCC could use the money to find ways to try to improve the sharing of spectrum, what do you think about that? Is that a possibility that we could, if we could give you the money without waiting for Congress to approve it, put it into a fund, you could use it to digitize and modernize, Dr. Wells, and you could use, Mr. Knapp, the moneys to find some way to try to bring about more efficient use of the spectrum allocated to the private sector now? Is that feasible?

Mr. KNAPP. Senator, as I testified earlier to the extent we can bring market mechanisms to bear on spectrum management, whether it is the government sector or the private sector, that probably is a good thing to look at. We would be happy to work with you on it.

Senator STEVENS. If I had spectrum, I couldn't lease it without your approval?

Mr. KNAPP. That is correct. That is why we initiated a proceeding called secondary markets to maintain the protections to control interference, for example.

Senator STEVENS. If that happened right now, you wouldn't keep the money, would you? It would go to the general fund?

Mr. KNAPP. That is correct.

Senator STEVENS. Dr. Wells, if we could arrange that you got the money, is that an economic incentive?

Dr. WELLS. You are saying rather than transfer the spectrum to find secondary market and release it. I have not considered that.

Senator STEVENS. Thank you, Mr. Chairman.

Senator INOUE. I have just one more question. Industry has indicated that they need DOD spectrum if we are to maintain our world leadership role in 3G. DOD says it needs its spectrum to carry out its mission. ITU now has set aside DOD's spectrum for worldwide use in 3G. We have no idea whether that worldwide use would interfere with DOD activities. Where do we request from here?

Dr. WELLS. Senator, if I may, the interference, spectrum interference with DOD operations overseas has been a fact of life for many years, whether this band or other bands. It is one of the reasons why we have spent a lot of time negotiating host nation agreements. I do not think we are ever going to get to a situation where we are going to designate IT band that is going to be for worldwide military ops and find it free of interference. This has not been a change from where we have been for a long period of time. Yes, it is true that 1755 has been one of the bands designated by the ITU, but it is one of only several. There are several other bands that could be used. I think as we look at the possibility for 3G, we just keep focusing on that one because interference occurs everywhere. We ought to take advantage of full opportunities here in the United States for this 3G service.

Senator INOUE. Is the use of the DOD band necessary if we are to maintain our leadership role in the world on 3G activities? Mr. Knapp and Mr. Hatch?

Mr. KNAPP. I would suggest that there is still more work to be done in looking at this. We have looked at some options already and I think you have heard and you will hear from the other parties that there is still more work that we can do in making more efficient use of the spectrum. So with more work, I think we probably can come up with a solution here.

Mr. HATCH. Thank you, Mr. Chairman. Yes. I would agree with Mr. Knapp. There are a number of options that have been put on the table and discussed in the DOD, FCC, the private sector has made some additional inputs and proposals for additional spectrum that could be made available. I think it would be prudent to sit down now and look at all of these options and see which options would be the best options to pursue to come up with a final answer for the spectrum.

Senator INOUE. Thank you very much. Any further questions? Thank you very much. You have been very patient. Your responses have been clear but at times aggravating. Where do we go from here?

Our next panel, Mr. Denny Strigl, CEO of Verizon Wireless; Mr. Carroll D. McHenry, CEO of Ncentrix Broadband Networks of Texas; Mr. Mark Kelley, Chief Technology Officer of Leap Wireless, San Diego; Thomas E. Wheeler, President and CEO of Cellular

Telecommunications and Internet Association; and Mr. Martin Cooper, Chairman and CEO, Co-founder, ArrayComm, Incorporated of San Jose.

Gentlemen, I thank you for your patience in waiting for us. May I now recognize the CEO of Verizon Wireless, Mr. Strigl.

**STATEMENT OF DENNIS F. STRIGL, PRESIDENT AND CEO,
VERIZON WIRELESS**

Mr. STRIGL. Thank you, Mr. Chairman. Good afternoon, Mr. Chairman, Members of the Subcommittee, thank you for inviting me to appear before you today. The allocation of adequate spectrum to support the continued growth of the wireless industry and the development of 3G services is the most important and timely issue facing my company. It is also vital, I believe, to the U.S. economy. Last year, the President's Council of Economic Advisors concluded that 3G services would provide more than \$100 billion in annual consumer benefits and urge the government to promptly allocate sufficient spectrum for 3G. I am grateful to this Subcommittee for its interest and support on this issue, but I must underscore that we need prompt action. Verizon Wireless has one of the most advanced mobile networks in the industry, and we make every effort to efficiently use the spectrum we have to meet the needs of our customers.

However, despite our deployment of the most spectrally efficient technologies available, the enormous growth in mobile voice and narrow band data services and the expected growth of advanced mobile services such as high-speed data will ultimately constrain our ability to meet future customer demand without additional spectrum.

Some people would suggest that we have no need for additional spectrum, and that using our existing spectrum more efficiently will solve the problem. With all due respect, I think that those arguments are self-serving. I don't believe anyone could know as well as we do the needs of our customers and the demands on our network, and particularly someone would not know this with many fewer customers or much lower demand levels. I come before you today to urge you to act quickly to make additional spectrum available to meet the needs of our customers while bringing critical benefits to the American economy.

The following actions, I believe, are needed. First, the Commerce Department and the FCC must allocate 200 megahertz of additional spectrum to support the continued growth of wireless services. The 1710 to 1850 megahertz band is a good start. And I believe that it was identified at the 2000 World Radio Conference as a primary candidate for 3G services and is the best choice for obtaining globally harmonized spectrum. Senator, the government and private industry must work together to develop an implementation plan for how and when the spectrum will be cleared for existing users and when it will be auctioned.

Third, a workable process must be established for reimbursing Federal Government users for relocation to other spectrum. To this end, I urge Congress to pass legislation that would compensate the departments of Defense and other Federal users directly through auction proceeds. This would guarantee that compensation funds

are available. The availability of funds for relocation, as well as modernization of Federal communications systems creates a win-win approach that is an important step forward in making spectrum available for 3G.

Mr. Chairman, I cannot overstate the importance of spectrum to my company and to the wireless industry. Earlier this year, my company bid nearly \$9 million for spectrum in Auction No. 35 which raised \$17 billion for the U.S. Treasury. This spectrum is necessary to meet the continued demand for mobile voice and to begin deployment of 3G services.

Ultimately, this spectrum is stuck in legal limbo with likelihood of protracted legal battles. Last week, Verizon Wireless joined with four other high bidders with that auction, namely Alaska Native Wireless, Dobson Communications, Salmon PCS and VoiceStream Wireless in a letter urging the Commission, the Department of Justice, and the Office of Management and Budget to achieve an immediate settlement of the next wave case that would preserve the results of the auction. Congress should do all it can to encourage the parties to settle. This is the best way to ensure that the valuable mobile licenses purchased at auction are put into the hands of the carriers who can deploy immediately to serve our customers.

The United States is the world leader in the development and deployment of advanced wireless technology, however, we are falling behind other nations in the allocation of spectrum that is necessary to support the development of the next generation of wireless technologies. I urge the Subcommittee to take every action you can to make spectrum available to the wireless industry so that carriers can deploy 3G services. Thank you again for your continued interest, and for your leadership on wireless policy issues.

Senator INOUE. Thank you very much, Mr. Strigl.

[The prepared statement of Mr. Strigl follows:]

PREPARED STATEMENT OF DENNIS F. STRIGL, PRESIDENT AND CEO,
VERIZON WIRELESS

SUMMARY

Mr. Chairman and Members of the Subcommittee, thank you for inviting me to appear before you today. The allocation of adequate spectrum to support the continued growth of the wireless industry and the development of Third Generation—or 3G—services is one of the most important and timely issues facing my company and my industry. We are grateful to this Subcommittee for its interest and support. Together we must find a way to quickly address the critical spectrum needs of this industry.

The deployment of 3G wireless services and technologies will enable U.S. industry to maintain its global competitive and technological leadership in both wireless and Internet markets. In a report published last year, the President's Council of Economic Advisers ("CEA") estimated that the benefits from 3G would likely approach \$100 billion annually. It concluded that an adequate supply of additional spectrum was needed for 3G services and urged government action making adequate spectrum available. If spectrum is not available on a timely basis, we risk squandering our global position and a panoply of associated economic and societal benefits.

Adequate spectrum was identified at the World Radiocommunications Conference ("WRC-2000") held in Istanbul, Turkey last year. The decisions reached at WRC-2000 were supported by the United States and more than 150 other world governments. While efforts by many government and private sector interests have led to some progress in achieving the necessary spectrum allocations in the United States, spectrum identified at WRC-2000 has not yet been reallocated nor is such action imminent. For that reason, I come before you today with a simple but urgent message: *the wireless communications industry must have additional radio spectrum to provide innovative new services and other critical benefits to the American public and*

to foster continued economic growth. We are facing the prospect of our industry's equivalent of a "fuel crisis"—with access to the spectrum "fuel" restricted by government policy and lack of action.

The following actions are urgently needed:

1. *Reallocation of adequate globally harmonized spectrum for mobile services.* As reflected in decisions made at WRC-2000, the U.S. wireless industry needs at least 200 MHz of additional spectrum, aligned with spectrum to be used in other regions of the world, to meet its long-term growth requirements.

2. *Development of an implementation plan for how this spectrum will be cleared and when it will be auctioned.* Equally important to the reallocation of needed spectrum is the plan setting out the timeframes when that spectrum will be auctioned and when it will be available for use by the industry. While all of the spectrum will not need to be available at once, operators need some certainty and predictability about what spectrum will be available and when.

3. *Establishment of a "workable" process for reimbursing Federal Government users.* Legislation is needed to allow the Department of Defense and other Federal users to be compensated directly through auction proceeds thereby guaranteeing that compensation funds are available. The availability of funds for relocation as well as modernization of Federal communications systems creates a "win-win" approach that is an important step forward in the process of making spectrum available for 3G.

4. *Elimination of the "spectrum cap".* This outdated rule limits the amount of spectrum a single company can own. In the intensely competitive wireless industry, this rule only impedes companies from competing for the spectrum needed to meet the future demand for wireless voice, data and other new services.

5. *Settlement of the NextWave case.* The loss to the American public and to American taxpayers will be enormous if this matter is not resolved quickly.

The continued growth of the wireless industry depends on the availability of adequate spectrum.

3G services will be the next important chapter in a continuing wireless success story. However, the ability of wireless operators to meet the demand for 3G services depends on three key factors. First, the wireless industry continues to grow at a rapid pace. Today, more than 110 million people in the United States subscribe to mobile services and that number continues to grow at an annual rate of more than 20 percent. Only 2 years ago, analysts predicted a healthy 60 percent of the public would subscribe to mobile services by 2008. But having reached 40 percent penetration this year, analysts now expect wireless penetration to hit 70 percent in 2004.

Second, wireless customers are using mobile voice services much more frequently than they ever have before. Between 1992 and 2000, the industry experienced a 20-fold increase in total wireless minutes of use. The 2000 total of 280 billion minutes of use reflects a compound annual growth rate of 50 percent. During this time, we have seen a tremendous surge in individual subscriber usage. Between 1997 and 2000, monthly usage per subscriber doubled, and it is projected to double again between 2000 and 2004.

Third, the growth of mobile data services is placing increasing demand on the network. Today, we offer data services at rates up to 14.4 kilobits per second. These narrowband data services support a variety of applications including instant messaging, e-mail and web browsing. However, the development of 3G and other innovative wireless technologies will support a wide range of high-speed data and multimedia applications, including wireless Internet access. While mobile data services currently represent less than 2 percent of total network usage, analysts predict that future data applications supported by 3G technology will account for more than 50 percent of network usage by 2004 and ultimately those applications will dominate the use of the network.

Technology improvements alone will not meet the anticipated demand for 3G services.

Digital technology has been a primary driver of the amazing growth of wireless services. Since introducing digital technology into our network in 1997, we have substantially increased the capacity and efficiency of our network and provided consumers with enhanced services and choices, including many new pricing plans. Digital handsets feature longer battery time and reduced equipment size and cost. Wireless services are more accessible and affordable. They have become a part of our customers' daily routines, and many use wireless as an alternative to a wireline telephone.

Verizon Wireless has one of the most sophisticated mobile networks in the industry, and we make every effort possible to use our spectrum efficiently to meet the needs of our customers. However, despite our deployment of the most spectrally-efficient technologies available, the enormous growth in customers and usage is placing

increasing strain on network capacity. To address these capacity problems, Verizon Wireless will begin to deploy 3G technology later this year. This technology—called cdma2000 1XRTT—will not only increase the efficiency of our existing network, but will allow us to provide customers with mobile data services at rates up to 144 kilobits per second—ten times what is currently available.

Our deployment of 1XRTT is just the next step in the continuous evolution of our network and our efforts to deploy the most advanced technologies possible for the benefit of our customers. Unfortunately, technology alone cannot meet our capacity and new service needs. The new high-speed services that can be provided on 3G networks are much more spectrum-intensive than today's voice and data services. For example, while 1XRTT is nearly twice as efficient as current CDMA technology in delivering voice services, for data services it will take three to four times as much spectrum to serve the same number of simultaneous customers at the higher data rates (i.e., 144 vs. 14.4 kilobits per second). As even higher speed data services are developed (e.g., up to 2 Mbits per second), the demand for spectrum will increase substantially.

As I have indicated, we can initiate some new high-speed services, and Verizon Wireless will be among the first companies to do so, but we will be bandwidth limited in the nature and scope of these services. The industry needs additional spectrum before the services can reach their potential anticipated by analysts. I can think of no better evidence of the industry's urgent need for new spectrum than the \$17 billion bid for C and F block PCS licenses that were recently reaucted.

This Subcommittee is in a key position to ensure that the needed spectrum is made available.

Congress has an important role in ensuring that spectrum resources are managed for the benefit of the American public—it is the public, after all, not carriers, that use these scarce resources to meet their communications needs. Given the significant benefits that 3G and other advanced wireless services will provide to American consumers, businesses, and the economy, Congress has every reason to ensure that adequate spectrum is available to support the full potential of such services. Other nations have already allocated and licensed sufficient amounts of spectrum to meet the needs of their wireless industries. The United States must do the same.

There are specific, concrete steps that Congress should take now:

1. Allocate the Additional Spectrum Needed for Mobile Services

WRC-2000 identified two spectrum bands to accommodate 3G development around the world. This action to identify spectrum on a global basis will provide the global "harmonization" that is so important to future services. By implementing the WRC-2000 actions and allocating harmonized spectrum, U.S. carriers will be able to compete globally in offering international roaming while achieving the economies of scale that reduce network and customer equipment and service costs.

The 1710–1850 MHz band, as identified at WRC-2000, provides the best, initial opportunity to harmonize U.S. spectrum allocations with those being made around the world and thereby to meet the 3G growth needs of the industry. The band is already used for second generation mobile services in Europe and parts of Asia, where it is expected to evolve to 3G. In Canada, Mexico, Brazil, and other parts of North and South America, this band is the first choice for initial 3G deployment. Even though the United States, at WRC-2000, supported the potential use of this band for global 3G services, most of the band is currently occupied by the U.S. Department of Defense ("DOD") and other Federal agencies. These systems will have to be relocated if the band is to be used for commercial wireless applications.

In cooperation with the wireless industry, the U.S. Government has worked diligently to assess the potential for making this band available for commercial use. My company and others from the wireless industry have been working closely with the FCC, the Department of Commerce, DOD, and various other Federal agencies to develop a workable reallocation plan. We have made progress, but a final decision on this band has not been made; nor is one imminent. Beginning with this hearing, this Subcommittee can provide the impetus for the quick allocation action we need.

Obviously since allocating the 1710–1850 MHz band alone will not satisfy the 200 MHz requirement, additional spectrum must be identified. To that end, the 2110–2165 MHz band, for example, is an appropriate and workable supplement. This band, most of which has already been proposed for reallocation, is encumbered with commercial fixed operators, and we are working with the FCC on relocation options.

Recent events suggest that the 1990–2025 MHz and 2165–2200 MHz bands, currently allocated as additional spectrum for Mobile Satellite Service ("MSS"), may better serve the public interest by being reallocated at least in part to more viable purposes. Reported business difficulties among the applicants for MSS licenses raise questions as to the viability of MSS. For these reasons, we and other carriers re-

quested the Commission to evaluate how this band could be used to facilitate the development of advanced mobile services, e.g., by accommodating the relocation of commercial and/or government systems from bands used for 3G.

2. Establish an Implementation Plan for Auctioning and Clearing Spectrum

Equally important to the reallocation of needed spectrum is the implementation plan setting out the timeframes when portions of that spectrum will be auctioned and when it will be available for use by the industry. The entire band will not be able to be auctioned at once, nor will it all be available at the same time, given the variety of incumbent uses. The industry can and will work with these logistical realities, but operators need certainty and predictability about what spectrum will be available and when so that we can develop our plans.

This implementation plan must reflect the need for allocation decisions that promote harmonization. For example, the Commission is considering whether to pair the 1710–1755 MHz band (for mobile transmit) with the 2110–2150 MHz band (for base transmit) largely, it would appear, because these bands were designated by statute to be auctioned by 2002. However, this statutory action was taken prior to WRC-2000. Today, such a pairing would be inconsistent with existing and anticipated future uses of this spectrum around the world. Were such a pairing to occur, mobile base stations and portable devices developed for U.S. markets would be incompatible with and more expensive than equipment developed for markets where spectrum is harmonized. Making the additional spectrum in the 1755–1850 MHz band available would permit the Commission to establish pairing arrangements that are harmonized worldwide. I urge you to quickly resolve the broader 3G spectrum allocation decisions so that the Commission can consider all viable candidate bands before taking action on a few. In doing so, the Commission can establish a spectrum allocation and auction plan that promotes harmonized use of spectrum, reduces the costs of 3G equipment and services, and increases the overall value of spectrum.

3. Establish a “Workable” Process for Reimbursing Federal Users

In establishing a *workable* process for clearing the 1710–1850 MHz Federal Government band, the method for reimbursing displaced Federal users can be improved and in so doing it may actually facilitate the clearing process. Current law requires that wireless operators negotiate with Federal agencies on relocation costs and timing after they have acquired their licenses at auction. Based on past experience, this “after-the-auction” approach means that operators have considerable uncertainty regarding the costs of relocation and the availability of spectrum, affecting their bidding strategy and the value they attribute to the license. It also imposes unnecessary transaction costs on operators when they proceed to the negotiation, and it may result in DOD and other Federal agencies being expected to disclose information about their systems that they contend is classified or proprietary.

The law can be improved by providing for the identification of relocation costs and timing in advance of the auctions and collection of relocation costs directly from the auction proceeds. In this way, operators would know the timeframe for spectrum clearing and the costs attributable to that clearing. For its part, the government users would know that their relocation costs would be fully compensated without the need for any negotiations with industry. Legislation should be adopted that would make these changes to the relocation and reimbursement process.

4. Eliminate the “Spectrum Cap”

The spectrum aggregation limit (“spectrum cap”) prohibits any company from holding more than 45 MHz of cellular, PCS and Specialized Mobile Radio (“SMR”) spectrum in the same geographic area, with a higher limit of 55 MHz in rural areas. At the time it was implemented, it was designed to promote new market entry by limiting access to the newly available PCS licenses. The actual impact of this rule can be even more limiting because of the non-uniform nature of the size of license areas and licensed bands. This lack of uniformity may prevent carriers from reaching even the cap limit in their full footprint.

The “spectrum cap” rule was adopted when there were only two carriers operating in each market, and when services were limited and prices were high. It was implemented to promote new entry in the marketplace, and that goal has been accomplished. Today, the Commission’s own studies show that 75 percent of the population lives in areas with five or more mobile telephone providers. Nearly 50 percent of the population has at least six carriers from which to choose. In Washington, D.C., for example, Verizon Wireless competes against Cingular, AT&T, Sprint, VoiceStream and Nextel.

New entrants continue to gain considerable ground. Price competition is steep, but perhaps even more important, carriers are competing on the basis of new and enhanced product features. The consumer is winning.

Because of the dramatic changes in the market, the rule has outlived its intended purpose and now is working to the detriment of the very competitive and robust market the rule sought to foster. The cap is not the way to perpetuate today's competitive market when the primary challenge is access to the additional spectrum we need to meet surging demand. The cap constrains our ability to meet customer demand for improved quality and reliability and for new services by obtaining additional spectrum. Lifting the cap will favor innovation and competition, facilitate the deployment of advanced mobile services and promote global competitiveness.

5. Encourage Settlement of the NextWave Case

I cannot overstate the importance of spectrum to my company and the wireless industry. Earlier this year, my company bid nearly \$9 Billion for spectrum in an auction that raised \$17 Billion for the U.S. Treasury. This spectrum is necessary to meet the continued demand for mobile voice and to begin the deployment of advanced 3G services. Unfortunately, this spectrum is stuck in legal limbo with the likelihood of protracted legal battles. Last week, Verizon Wireless joined four other high bidders in Auction No. 35—Alaska Native Wireless, Dobson Communications, Salmon PCS, and VoiceStream Wireless—in a letter urging the Commission, the Department of Justice, and the Office of Management and Budget to achieve an immediate settlement of the NextWave case that would preserve the results of the auction. Congress should do all it can to encourage the parties to settle. This is the best way to ensure that the valuable mobile licenses purchased at auction are put into the hands of carriers to deploy immediately to serve customers.

CONCLUSION

Congress must act now to ensure the timely allocation of additional spectrum and the adoption of policies that will promote the development of 3G wireless technologies and services. This includes: (1) allocating a minimum of 200 MHz of additional, harmonized spectrum for mobile services, (2) establishing a plan for clearing and auctioning spectrum, while ensuring that all bands are dealt with as part of a comprehensive allocation plan that is harmonized worldwide, (3) revising the reimbursement process so displaced Federal users are reimbursed from auction proceeds, (4) eliminating artificial restrictions on access to the spectrum we need, and (5) settling the NextWave case so that service can be provided to the public and Federal auction revenues can be maximized.

Senator INOUE. Mr. McHenry.

**STATEMENT OF CARROLL D. McHENRY, CEO,
NUCENTRIX BROADBAND NETWORKS, INC.**

Mr. McHENRY. Good afternoon, Mr. Chairman, and Members of the Subcommittee, thank you for holding this hearing and inviting me here. I am Carroll McHenry, Chairman and Chief Executive Officer of Nucentrix Broadband Networks based in Carrollton, Texas. We are the third largest holder of MMDS/ITFS spectrum in the United States behind Sprint and WorldCom, covering millions of homes and small towns and rural communities, in Texas, Oklahoma, Kansas, Illinois, and several other states. We are licensed to deploy broadband services in these markets, bringing broadband to over 90 such smaller towns in rural America will be our only business.

I am here not only on behalf of Nucentrix, but also on behalf of many other commercial operators, thousands of K to 12 and higher education institutions who have joined forces to deploy broadband commercial and educational services. I am also here to tell you that the deployment of high-speed Internet in our markets has been seriously delayed as a result of the government's efforts to find additional spectrum.

The cloud of uncertainty over our spectrum has shut down access to capital markets. As a result, we are currently unable to finance the buildout of our licensed network. While we agree that potential 3G mobile services are very important, so are fixed wireless

broadband services, especially in the market that we serve. Today, I ask you to help end this uncertainty by urging the FCC to remove our spectrum from further consideration for 3G. The FCC staff has concluded that MDS and ITFS are not viable for 3G. In fact, the record shows there are more appropriate spectrum bands for 3G.

There is no good reason to delay a decision regarding our spectrum while the FCC explores more desirable options for 3G. If our spectrum is held hostage to further proceedings, our rural broadband deployment will be delayed, and maybe foreclosed altogether. Fixed broadband wireless is vital to rural America. Five years after the Telecommunications Act of 1996, broadband in rural America remains extremely limited.

For example, in my home State of Texas, the PUC concluded in a recent report that the ILECS have largely ignored rural subscribers. There are no CLECS providing DSL to rural Texas, and only 5 percent of the rural counties in Texas have cable modem and most Nucentrix markets like Midland, Texas; Manhattan, Kansas; Peoria, Illinois, and the rural areas surrounding these towns, businesses and consumers have few, if any, broadband choices. In these choices, our fixed wireless service may be the only broadband option available. Additionally, in markets that actually have DSL and cable modems, we and other MDS companies may provide the only competitive broadband alternative to the ILEC and cable duopoly. Just recently, several large ILECS and cable modem providers announced price increases for their broadband services. Without an alternative, the duopoly has no incentive to lower prices.

Regarding spectrum management, it is important to remember that Nucentrix and other operators purchased many of our licenses at auction in 1996. The FCC encouraged additional investment with the rulemaking they authorized the bands for digital two-way services. We are now faced with the prospect of losing the licenses purchased at auction only months after receiving authority for two-way broadband services. If winning bidders can not be assured that the government will honor its commitments and allow them to operate their licenses, integrity of the auction process would be undermined. The MDS and ITFS industry has invested billions of dollars in acquiring licenses, developing technology, and preparing to deploy broadband wireless networks.

Nothing in the FCC's 3G record credibly supports reallocation of our bands. 3G carriers prefer other spectrum, and the FCC is exploring those other alternatives. Mr. Chairman time is of the essence. The bottom line is that Nucentrix needs capital to bring broadband services to rural America. The uncertainty created by the 3G spectrum search has shut down investment. Please help us to get moving again for rural America, urge the FCC to take MDS and ITFS off the table now. Thank you very much.

Senator INOUE. Thank you very much, Mr. McHenry.

[The prepared statement of Mr. McHenry follows:]

PREPARED STATEMENT OF CARROLL D. MCHENRY, CEO,
NUCENTRIX BROADBAND NETWORKS, INC.

Mr. Chairman and Members of the Subcommittee, my name is Carroll D. McHenry. I am the Chairman and Chief Executive Officer of Nucentrix Broadband Networks, Inc. ("Nucentrix"), headquartered in Carrollton, Texas. Nucentrix is a facilities-based, last mile provider of broadband fixed-wireless Internet and multi-

channel video service over Multipoint Distribution Service (“MDS”) and Instructional Television Fixed Service (“ITFS”) spectrum in the 2.1 and 2.5 GHz bands. We are the third largest holder of MDS/ITFS spectrum in the United States, behind Sprint and WorldCom, with a coverage area of approximately 9 million homes in mostly rural communities across Texas, Oklahoma, Illinois, Missouri, and other states in the Midwestern United States. I am here not only on behalf of Nucentrix but also on behalf of Sprint, WorldCom and the thousands of ITFS licensees across the country who have joined forces to defend the MDS/ITFS spectrum. I have over 20 years of experience in the management and operation of telecommunications companies, including fixed wireless, mobile wireless and wireline telephone service providers.

Nucentrix’s mission is to provide low-cost, reliable, broadband data and voice service in primarily rural markets. I am here to tell you that our mission has been seriously jeopardized because of the cloud of uncertainty that hangs over our spectrum as a result of the government’s efforts to find additional spectrum for third generation (“3G”) mobile wireless services. This regulatory uncertainty has chilled investment and prevented the access to capital that is necessary for us to complete the build-out of our broadband networks.

I urge you to support our efforts to remove the MDS and ITFS bands from further consideration in the 3G proceedings. There are three compelling reasons for the Federal Communications Commission (“FCC”) to take this action now. *First*, the extensive record developed by the FCC demonstrates that the MDS and ITFS bands are not appropriate for reallocation to 3G, and that 3G proponents overwhelmingly prefer spectrum *other* than MDS/ITFS for their services. *Second*, removing the regulatory uncertainty surrounding MDS/ITFS spectrum will bring renewed certainty and credibility to the spectrum management and auction policies of the FCC. *Third*, removing the MDS/ITFS bands from further consideration in the 3G proceedings will result in immediate and tangible benefits to the American public and provide, among other things, a competitive alternative to the digital subscriber line (“DSL”) and cable modem services of the incumbent local exchange carrier (“ILEC”) and cable duopoly, especially in rural America where few broadband options currently exist. I would like to talk briefly about each of these points.

THE RECORD AT THE FCC

MDS and ITFS spectrum has been the subject of extensive studies and proceedings for possible reallocation to 3G mobile wireless carriers for almost a year. During this time, the FCC has placed the spectrum under a microscope. The FCC staff issued an Interim Report on MDS and ITFS spectrum in November 2000, a Notice of Proposed Rulemaking in January 2001 and a Final Report in March 2001. The FCC requested public comment on each of these items, and voluminous comments, reply comments and ex parte submissions were placed into the FCC record.

After months of study and analysis there is *nothing* in the FCC record that supports reallocating MDS/ITFS spectrum for 3G mobile service. Indeed, the Final Report released by the FCC staff on March 31, 2001 demonstrates conclusively that the fixed wireless services provided over MDS/ITFS spectrum should not be sacrificed for the benefit of 3G mobile services. I would like to highlight just a few of the findings from the Final Report for you today.

The FCC staff found that the “MDS industry has invested several billion dollars to develop the band for fixed wireless data systems,” and that “these systems will provide a significant opportunity for further competition with cable and digital subscriber line (DSL) services and deliver broadband services to rural America.” *Final Report at 13.*

The FCC staff acknowledged there was “no readily identifiable alternative frequency band that could accommodate a substantial relocation of the incumbent operations in the 2500–2690 band.” It also found that relocation “to higher bands could affect significantly the economics of current and planned ITFS and MDS systems and lessen their ability to provide service in rural areas or smaller markets.” *Final Report at iii.*

With regard to “segmenting” or dividing the bands for 3G services, the Final Report found that “delivery of fixed broadband wireless services to the public and educational users would be delayed, and in rural areas or smaller markets, may never be realized.” *Final Report at 92–93.*

The FCC determined that sharing the MDS and ITFS bands with 3G systems was technically infeasible. *Final Report at 36.*

And finally, regarding the educational licensees with whom we share our spectrum, the FCC staff found that such licensees “make extensive use of their spectrum to provide formal classroom instruction, distance learning, and video conference ca-

pability to a wide variety of educational users throughout the nation.” *Final Report at 13.*

In addition to these findings, the record established at the FCC shows that the MDS/ITFS bands are not the preferred bands for 3G services. Rather, the record demonstrates that the 3G community prefers the 1.7 GHz band allocated for government use. In addition, there is other spectrum in a wide variety of bands that may be considered for 3G services, including the 700 MHz, 2110–2150 MHz and 1990–2025/2165–2200 MHz bands. Given that nothing in the FCC record credibly supports reallocation of our bands, that 3G proponents prefer other parts of the spectrum and that the FCC may identify alternative spectrum for 3G services, I respectfully submit that there is no good reason to continue to hold our spectrum hostage and further delay a decision while the FCC explores other more desirable options.

SPECTRUM MANAGEMENT

A second reason for removing MDS/ITFS spectrum from further consideration for 3G services is that it will bring renewed certainty and credibility to the FCC’s spectrum management and auction policies. A bit of history about MDS and ITFS spectrum will help put this point into perspective.

As originally licensed, MDS and ITFS spectrum was used primarily for one-way analog video programming. Commercial MDS providers, including Nucentrix, used the spectrum to provide so-called “wireless cable” services to consumers, and their educational ITFS partners used the spectrum to deliver one-way educational programming to classrooms.

However, in late 1998, after a lengthy and complex rulemaking proceeding, the FCC issued new rules that would permit MDS/ITFS licensees to use their channels for a wide array of digital two-way data, voice and video services. The new FCC rules marked a significant milestone in the evolution of our spectrum. Among other things, these new two-way rules were intended to spur competition in the market for high-speed Internet access and data communications services. They were also intended to help ITFS licensees whose educational needs increasingly required broadband access.

In reliance on the FCC’s rules and policies, the MDS industry invested *billions* of dollars acquiring spectrum, preparing and filing complex two-way license applications with the FCC, developing next generation equipment, and planning and building the infrastructure needed to offer broadband wireless service to the public. In August of last year, Nucentrix filed over 400 applications with the FCC to provide broadband service in 70 markets. Just a few months ago, we began to receive FCC licenses for these markets, and now have approval for over 90% of our applications filed, covering more than 60 markets.

The issuance of these licenses *should* be good news for Nucentrix and the millions of residents and thousands of businesses in our service areas. However, the news is not good because the cloud of uncertainty that hangs over MDS and ITFS spectrum as a result of the search for more 3G spectrum has chilled the capital investment Nucentrix needs to build new networks in unserved and underserved communities. Protracted uncertainty may chill investment permanently.

This is fundamentally unfair. The FCC *encouraged* companies like Nucentrix to invest in MDS/ITFS spectrum and networks. The FCC *encouraged* educators, commercial service providers and equipment manufacturers to invest in the very expensive conversion of this spectrum from one-way analog video to two-way digital broadband service. Now, just as the services contemplated by the FCC are being rolled out, we are frozen in our tracks because the 3G proceeding has chilled the capital investment we need to build out our networks. After months of study and no support for continuing to include MDS/ITFS spectrum in the FCC proceedings, the MDS/ITFS community deserves a resolution of this issue.

Mr. Chairman, there is another problem that I must mention. Nucentrix and other commercial operators purchased many of their MDS licenses at auction. Among other things, we paid for the exclusive right to provide fixed wireless services within our Basic Trading Areas. We are now facing the possibility of losing the licenses we purchased at auction mid-way through the term of the authorizations, and only months after receiving licenses for two-way digital services. If winning bidders at spectrum auctions cannot be guaranteed, with reasonable certainty, that the government will honor its commitments and allow them to operate their licenses for the full term, the credibility of the auction process will be irreparably destroyed. Certainty and stability must be maintained in formulating and implementing spectrum management policies.

PUBLIC BENEFITS

A third reason for removing our spectrum from further consideration is that such action will provide immediate and concrete benefits to the American public.

Competition and Broadband to Rural America. Removing MDS/ITFS spectrum from further consideration in the 3G proceeding will unleash a compelling competitive alternative to the ILEC-DSL and cable duopoly, especially in rural America, consistent with the mandate of Congress in the 1996 Telecommunications Act. The fixed wireless systems being deployed by Nucentrix and other MDS operators can cover up to a 3,800 square mile area from a single tower and offer symmetric transmission speeds of between 256 Kbps to 1.5 Mbps. These vast coverage areas and high data rates are ideal for serving rural areas that, in many cases, are unable to receive any wireline broadband service offerings.

The FCC recognized the unique opportunity provided by MDS and ITFS spectrum in a November 2000 report, when the FCC stated that in rural or otherwise underserved markets in this country, ITFS and MDS licensees may be the sole provider of broadband service. In a report to the Texas legislature in January 2001, the Texas PUC concluded that the last mile to the residential customer remains the largest constraint on the availability of broadband services, particularly in rural areas where low population densities and longer distances make it too expensive to deploy wireline services. The Texas PUC also found that (i) there are no competitive local exchange carriers providing DSL access lines in rural areas in Texas, (ii) ILECs have largely ignored rural subscribers and (iii) only 5% of rural counties in Texas have cable modem service.

Five years after passage of the Telecommunications Act of 1996, the availability of affordable broadband in rural America remains limited. In our markets like Midland and Tyler, Texas, Tulsa and Stillwater, Oklahoma, Columbia and Springfield, Missouri, and Champaign and Peoria, Illinois, consumers and small businesses have few, if any, affordable broadband options. In markets like these, Nucentrix's fixed wireless service is likely to be the *only* broadband service available to many of the homes, offices, schools, hospitals, and community centers for the foreseeable future.

To date, the chief way alternative broadband service providers could compete with the ILEC and cable duopoly was to buy services from their competitor and resell them. That model has failed as many competitive local exchange carriers have gone bankrupt or closed their doors. As competition has dwindled, consumer prices have risen. Recently, several of the large ILECs announced simultaneous price increases of up to 25% for their DSL service. These ILECs also have mobile wireless affiliates that demand more spectrum for 3G services. Without a facilities-based competitive broadband alternative that can completely bypass the ILEC-DSL and cable facilities, like fixed wireless, the duopoly has no incentive to lower prices. The benefits of competition in the broadband services market will not be realized without an alternative to the services offered by the duopoly. Fixed broadband wireless services offered in the MDS/ITFS spectrum can be that alternative.

Equal Access To Information Technology. Facilitating the deployment of fixed wireless services in the MDS/ITFS bands also promotes equal access to all information technology for all Americans. The dramatic difference in broadband access between urban and rural America, and between affluent and poor Americans, has been identified and addressed in a series of NTIA publications. NTIA estimates that those who are poor and live in rural areas are about 20 times more likely to be left behind than wealthier residents of urban areas. As I mentioned earlier, in Texas for example, where approximately one-third of Nucentrix's markets are located, there are no competitive local exchange carriers providing DSL access lines in rural areas, and ILECs have largely ignored rural subscribers. The deployment of advanced fixed wireless services in the MDS/ITFS bands will help close this information technology gap.

Important Educational Initiatives. Finally, rapid deployment of broadband services in the MDS/ITFS bands will help ensure the success of the important educational initiatives that are currently underway. Nucentrix has over 400 ITFS partners, consisting primarily of local independent school districts, small colleges and universities and faith-based educational organizations in rural areas. Nucentrix and other MDS operators contribute directly to the support of education, and supply the infrastructure to enable schools to satisfy their broadband and distance learning requirements. Today, by incorporating broadband technology into their curricula, educators are building plans to deliver multimedia, interactive, self-paced instruction to students at all levels and in all settings—urban and rural, rich and poor.

WE NEED YOUR HELP

I want to thank you for holding this important hearing. I realize that the FCC, Congress and the Administration are faced with critical and complex decisions regarding how best to accommodate spectrum capacity demands of constantly evolving wireless technologies. Nucentrix does not disagree that some amount of additional spectrum may be necessary for transitioning existing mobile services to the 3G standard in the future. However, we do not believe that finding additional spectrum should come at the expense of fixed wireless broadband services that provide the only feasible solution for providing ubiquitous broadband service throughout the United States and that support the critical educational programs of our ITFS partners.

I respectfully ask for your support to remove the MDS/ITFS bands from consideration in the 3G proceedings. The record at the FCC simply does not support re-allocation or relocation of these bands for 3G. Yet, the regulatory uncertainty that hangs over this spectrum has shut down new investment and prevented companies like Nucentrix from building out broadband networks in rural and underserved communities. Please, don't allow the important broadband and educational services being provided over this spectrum to continue to be held hostage to efforts to find more spectrum for commercial 3G services.

Thank you for the opportunity to testify today.

Senator INOUE. Mr. Kelley.

STATEMENT OF MARK C. KELLEY, CHIEF TECHNICAL OFFICER, LEAP WIRELESS INTERNATIONAL, INC.

Mr. KELLEY. Thank you, Mr. Chairman, Members of the Subcommittee, for the opportunity to speak here today before you. My name is Mark Kelley. I am the Chief Technical Officer of Leap Wireless in San Diego. All of you are familiar with AT&T, Verizon, Cingular and other large wireless carriers. You are probably also familiar with large trade organizations such as the CTIA, but most likely, you are not familiar with Leap Wireless. Briefly, we provide unlimited local mobile phone use for a very low price. Our customers' average bill is about half of the national average for mobile phone bills, however, our subscribers use their Cricket mobile phones far more on average than other wireless carriers, about 1,100 minutes per month of use versus an average of around 300 nationwide. The average bill for our subscribers is \$35 a month. We offer a \$29.95 unlimited use plan.

Clearly we are more of a land line replacement than a classic mobile phone company. We provide the service using only 10 to 15 megahertz of spectrum and we are deploying 3G this year and next. I have a few simple messages again. The first is as Mr. Strigl said, the United States is a world leader in 3G technology. An area we are not ahead in is adoption. Adoption is behind other areas in the world. One of the reasons for that, of course, is we have a fantastic land line network. Another reason is there is not enough opportunity for companies like Leap to innovate and offer plans like we do. Innovation was a key for Leap, could be a key to others.

What we do is what several Members spoke of and the Chairman in the discussion prior to this, which was about efficient use of spectrum. We are using incredibly efficient spectrum technology. It is a very scarce public resource, only about 2,000 megahertz are available. We believe that all carriers should be required to use spectrum as efficiently as we do.

As I said, we are going to deploy 3G this year and the technology we are using, CDMA 2000 has a couple components to it. One component is called 1 XRTT. It gives you 3G like data speeds for fully

mobile environments. The New England component is 1 XEV data optimized. That component can provide over 2 megabits a second in fixed and some local environments. We are going to deploy that early next year.

When it comes to evolving technology and growing, the best way to do it is a way that is truly evolutionary. Kind of the way color television was using the same spectrum as black and white, but people did not have to go out if they couldn't afford to and get a new TV to watch the same channels. People who could afford a color TV could see it in color. What we are doing with 3G, we will use the same spectrum we are using today for 3G. For people who do not have new handsets, they won't have the new services. For people who can afford the new ones, the new services will become available to them. We are doing that with 10 to 15 megahertz of spectrum that we own today.

Using and releasing more spectrum for commercial use does make sense when it serves the national interest. It does that when efficient use is made of all the spectrum, all the spectrum and all the markets. One way that the FCC has encouraged people to use the efficient spectrum is via a mechanism called a spectrum cap. The spectrum cap only allows any single carrier to own 45 megahertz in an urban market and 55 in a rural market. That is a lot of spectrum. Keeping that cap will protect consumers. In the spectrum that we are using today, we will be able to allow 3G and accommodate big and small markets. It would take more spectrum to accommodate higher density population markets.

So our final message is we believe you can do 3G in a spectrum that is available today provided everyone is using all their spectrum efficiently and that every hertz of spectrum is looked at that is available right now for commercial use and it is ensured that that is used efficiently. We do not believe there is as much of a crisis to get new spectrum in the hands of carriers today who already have a lot of spectrum in order to do 3G. Thank you.

Senator INOUE. Thank you very much, Mr. Kelley.

[The prepared statement of Mr. Kelley follows:]

PREPARED STATEMENT OF MARK C. KELLEY, CHIEF TECHNICAL OFFICER, LEAP
WIRELESS INTERNATIONAL, INC.

Mr. Chairman and Members of the Commerce Committee: Thank you for the opportunity to appear before you today. I am Mark C. Kelley, Chief Technical Officer for Leap Wireless International, a San Diego-based wireless communication carrier. Leap provides wireless service under our Cricket Communications brand in over 20 markets, including markets in Nevada, Louisiana, Tennessee, Oregon, Georgia, North Carolina, California and many other markets across the US. We are a new, and we believe quite innovative, carrier.

All of you are familiar with AT&T, Verizon, Cingular and the other large wireless carriers. You may also be familiar with the leading industry trade organization, CTIA, but you most likely have never heard of Leap. We provide unlimited local mobile phone use for a very low fixed monthly price. Our customers' average bill is about half the national average for mobile phone bills. However, our subscribers use their Cricket mobile phones far more on average than other wireless carriers—1,100 minutes per month, compared with an industry average 300 minutes. Clearly we are more of a landline replacement than a classic mobile phone company. We provide this service using only 10 to 15 MHz of spectrum—total.

Our message to this Subcommittee is very simple. First, we believe the Subcommittee needs to understand the facts about 3G services, and the spectrum required to deliver those services. Second, we believe that the best use of scarce wire-

less spectrum is to have a holistic approach that focuses on competition-driven innovation and efficient spectrum use.

Let me first speak about technology. First generation mobile services were essentially putting two-way analog FM radios in small, mobile packages. This technology served its purpose and is still in use today. Second generation mobile technology was essentially a digital version of first generation. This “generational” shift provided higher capacity, security and the ability to transmit digital data directly. This dominant digital technology takes several flavors—European created GSM technology and US created TDMA and CDMA technology.

We are now at the point of another technology shift to Third Generation technology. The primary driver of this shift is to desire provide higher data speeds, and when possible, higher voice capacity. The overall requirements of 3G services are universal: to provide 144 Kbps data speed for vehicular speed service and up to 2000 Kbps for fixed applications; speeds comparable with landline broadband services. While there were several quite different technical approaches to meet second-generation requirements—which were quite different around the world—there is one fundamental approach to third generation—CDMA technology pioneered here in the U.S.

There are two flavors of this 3G CDMA technology. One flavor is an evolutionary growth for carriers who currently use US CDMA as their second-generation technology, such as Leap, Verizon, Sprint and others. That flavor is called cdma2000. cdma2000 will be rolled out in several phases.

The first phase of this third-generation technology will provide over 144 Kbps data rate (high speed wireless data) for vehicular speed applications. At the same time, this technology will nearly double the amount of voice phone calls that can be carried across a fixed amount of spectrum. That is to say, it nearly double today’s voice capacity. Leap and several other carriers will be deploying this first phase of 3G technology later this year, using our existing spectrum.

I’d like to take a moment to discuss voice capacity. Carriers using the US developed CDMA second-generation digital technology enjoy a three to four times voice capacity advantage over those using GSM technology—assuming the same amount of spectrum. Stated differently, a carrier using GSM technology needs three or four times the amount of spectrum to carry the same amount of calls as does a 2G CDMA carrier. This “voice capacity” gap will continue to increase as we follow our different technology paths. Indeed, after rolling out the first phase of 3G the capacity gap will be more like ten times the voice capacity.

The second phase of cdma2000 is focused on high mobile data speed. It will provide fixed data speeds of up to 2,400 Kbps—over 100 times faster than is available today. This technology will likely spur rapid wireless broadband data penetration where it is deployed. We at Leap plan to deploy this second phase of 3G early next year in several markets. We will be deploying these two phases of 3G in our existing spectrum, which as I mentioned is primarily bands of 10 MHz and 15 MHz total.

The reason we are able to deploy 3G technology here in the United States during the next 12 months is due to the technology path we have chosen—cdma2000—which was developed here in the U.S., precisely to address the capacity needs that U.S. engineers knew would exist in this country.

There is another flavor of CDMA technology that will be used for 3G called WCDMA. WCDMA stands for Wideband CDMA, so called because of the wide channels that it uses. Unlike cdma2000, WCDMA requires large new swaths of virgin spectrum to launch even a single channel.

WCDMA has been described by its developers as the “world standard” 3G technology. It was developed by Europeans to be put in the new spectrum they auctioned last year. WCDMA is the “evolution path” for European-designed second generation GSM technology.

If you believed some of the press reports and marketing materials you would think that the U.S. is behind Europe because we have not yet cleared out sufficient spectrum so that carriers would be able to deploy this flavor of technology. The glaring irony here is that the U.S. flavor of technology outshines the European flavor no matter how you measure it from a technological perspective, and yet some here in the U.S. who have chosen the less efficient European path complain that somehow the U.S. will “fall behind” Europe and Asia if we don’t follow their lead.

But the European rush to 3G has, so far anyway, been a disappointment—with frequent reports of new delays in deployment. This is a result that must be avoided. Prudent spectrum management will accomplish goals in the national interest by maximizing efficiency and spurring competition. What matters most is not how much spectrum is made available, but how that spectrum is used.

Technology needs to be tried, tested, improved and made reliable before it is ready for widespread commercial use. And the best technology path is one with a painless

evolution from existing standards into new standards without requiring excessive cost and lots of new spectrum. For example, when color TV was introduced there was no need to clear out lots of new spectrum—the technology allowed the color portion fit into the existing spectrum. Additionally, the system was backward compatible so that folks who could not afford a new color TV right away could still use their black and white TV while viewing the same signal. The wireless technology path that Leap and some other US companies are using does the same thing—it permits second and third generation technologies to co-exist in the same band, efficiently.

The ability—and the need—to innovate and compete, to try new businesses and new technology, has made ours the greatest economy in the world. The fact that U.S. engineers developed CDMA in the first place is testimony to that. Businesses will innovate when they need to.

Consider the Internet, where we've recently seen great innovation. Now, only the strongest, most innovative, are surviving. The attractive aspect of the Internet for innovation is that the so-called "barriers to entry" are low. A few software engineers, some computers and office space and you're off to the races.

The same cannot be said of wireless services. The barriers to entry there are high—and in some cases literally insurmountable—because the available spectrum is held primarily by a small set of very large carriers. And when they hold all the spectrum, they can exclude others. This stifles competition, and it stifles innovation.

The FCC has a policy that promotes competition, while also forcing carriers to use spectrum efficiently. That policy is the spectrum cap, which prohibits a single carrier from holding more than one-fourth of the total spectrum available for use. The spectrum cap is a good policy. It leaves room for innovators like Leap, and it ensures that carriers use spectrum efficiently.

While some carriers complain about the cap, in fact the current spectrum cap of 45 MHz is an extraordinary amount of spectrum. We at Leap are providing full PCS service, with an average of 1,100 minutes of use per month with 10–15 MHz of spectrum. We could provide unlimited service to every single human being in our service area with about 25 MHz of spectrum. And I'm not sure I'd really know what to do with 45 MHz.

It's true that some foreign carriers have over 60 MHz of spectrum. But beware of analogies to situations that are not analogous. The population density here in the U.S. is around about one-tenth that of Europe. Likewise, relatively inferior wireline service there has led to greater use of wireless as an alternative. When you combine the use of relatively inefficient GSM technology with higher population densities and greater usage, it is clear that foreign carriers would need significantly more spectrum than the their U.S. counterparts.

Does that mean that Leap believes no new spectrum is ever needed for commercial mobile use here in the U.S.? No. We are frustrated by the fact that we are currently not able to offer our innovative Cricket service in our own headquarters—the city of San Diego, and other places in the U.S. We believe that Congress and the FCC should work to make spectrum available, and should ensure that spectrum is used efficiently, by the maximum number of competitors.

However, we are concerned if spectrum management is hastily performed for the purpose of "not falling behind" some imaginary lead held by some other countries, that will make the U.S.'s competitive situation worse, not better. Congress and the FCC should ensure that what spectrum we have is used efficiently.

In summary, I would like to reiterate that the U.S. has a technology lead in wireless; we are not behind anybody. And Congress should be skeptical of any claims that carriers need vast swaths of new spectrum to deploy third generation technology: Leap will deploy 3G services within the next 12 months, using small amounts of spectrum that it already has. Our spectrum policy should focus on innovation through competition, and should encourage the efficient use of this scarce public resource.

Senator INOUE. Mr. Wheeler.

**STATEMENT OF THOMAS E. WHEELER, PRESIDENT AND CEO,
CELLULAR TELECOMMUNICATIONS AND INTERNET
ASSOCIATION**

Mr. WHEELER. Thank you very much, Mr. Chairman. There is a spectrum shortage in this country. Technology is part of the solution, but it is not all of the solution. And let me say at the outset in response to the previous panel, we stipulate, clearly, we all are

Americans first. We all recognize that we have the best military in the world, and we want to keep it that way. The challenge that we face is both for the economy and for the military in the long term, as well as the short term. We can show you a couple of examples.

This is an overview of where we stand as a Nation today. In terms of our spectrum availability, compared to our international competitors, and as you can see, we are significantly lagging behind where the other countries who are developing services, developing technologies, and expanding their reach are in terms of their base. Now, the question becomes where do we go from here? Unfortunately, the story gets worse. Let us look at the next chart for a second here.

You have been talking about the ITU, Mr. Chairman, and their forecasts. The ITU says that for this country, there is a need for 390 megahertz to deliver both voice and data. Now, that is less than they say is needed in Europe, Asia and some other places because of our geography and some of these other factors. But here's the real startling fact in that statistic.

See this dot right here? That was the penetration that the ITU assumed would drive the spectrum needs. The yellow line, however, is the penetration expectations and forecasts of the market analysts, so the problem is that what this is saying is that even if 200 megahertz of spectrum fell into our lap today, the assumption upon which the voice component alone is based says that that may be insufficient.

Now, this shortage hits carriers differently. You just heard Mr. Kelley, Mr. Strigl, who by the way, use the same CDMA technology in their systems. One says I need new spectrum and the other says no, he does not. But the important thing is that the time is running out. We cannot have a technological debate or a using policy to advantage one competitor over another.

While we are debating, problems are happening around the world. Let us take a look at this map, for instance. The green represents those countries which either currently have planned or have indicated that they intend to offer wireless services in the 1710–1850 megahertz. Now, you heard Dr. Wells say that China was going to 2400 megahertz as well, yet it is green on this chart. The answer is yes to both. China has indicated they are using the 1700 to 1850 band, as well as looking at using the other band as well, but the point of the matter is that the United States of all of the major countries of the world is the entity that does not have spectrum that is harmonized with the rest of the world.

Now, that has an impact on consumers. Because it means that the United States does not participate in the scope and scale economies that everybody else, all the other consumers and their companies in those other countries, participate in. It means higher rates for equipment. It means lower, slower development and introduction of new products. I mean, I am sure you are as sick as I am of the articles that say why is it the United States is behind the rest of the world in terms of wireless services? Spectrum is one of the issues, and the lack of harmonized spectrum is the other issue. But the other part is this has a huge impact on the military, because we have a forward, we have a forward deployed military. And when they go to these green countries, what do they find?

This is what the Defense Department in their report on spectrum said. And they said that they have already found that when they deploy in Europe, that there is interference coming from wireless usage because those bands have been assigned by the European governments to wireless. In Korea, team spirit, the operation Dr. Wells talked about, had to knock off of the air some of the Korean cellular network in order to be able to operate American radio networks, and it is not going to get better, because if you flip this over, this is what the growth looks like of wireless subscribers around the world. And while there is a problem today, there is going to be a huge problem tomorrow, as you have hundreds of millions of consumers operating in the spectrum that our Defense Department is going to deploy in. This is a problem that is recognized by the Defense Department. Here is a report that was published recently, November, I believe, by the Defense Science Board, which as you know is the think tank of the Defense Department.

Look what they said. This may be too fine to read from up there, but let me just highlight here, the current defensive nature of DOD's spectrum policy and its reluctance to consider alternative spectrum concepts, including sharing with non-Defense users, leaves the military vulnerable to losing mission critical spectrum access. These important changes are not well understood by DOD leadership, and here is the most incredible sentence right here. Other nations are aggressively asserting their sovereign rights to manage their own spectrum, complicated OCONUS, outside the United States, deployments. This is the Department of Defense's own think tank saying that the lack of harmonized spectrum is a problem for our soldiers, sailors and airmen. That is the current reality.

The current reality in the industry is that the lack of harmonized spectrum means that our consumers and our international competitiveness is going to get worse. Our military situation is getting worse. Our competitiveness and our consumer situation is getting worse. There has to be a common solution here. There has got to be a fix to this, because we are both on the shore. There has to be a win-win. I would suggest that I was really heartened by Dr. Wells' testimony, and by some of the material that DOD has prepared in their own spectrum report because they suggest themselves that there are solutions. This is a reprint from the Defense Department's own spectrum report. I want to call your attention to this section right here.

Band vacation may be feasible under the following conditions. No. 1, requires provision of comparable spectrum. We agree. There needs to be comparable spectrum. There can be comparable spectrum. No. 2, requires timely cost reimbursement. We agree. Senator Stevens talked about the value of the spectrum that would be auctioned off. We agree that ought to go to the Defense Department, directly, do not pass go. No. 3, requires respect for DOD timelines to vacate. We agree with that, that we do not, we are not here asking you, Senators, for 200 megahertz just to land tomorrow, but a plan that says how do we work through that with the Defense Department. We think that these dates that they put in are a little tardy. But that a plan can work through this.

And in that regard, again, I want to focus on Dr. Wells' comment that he said several times as I heard him that he was eager to move forward on this, and he said that there were solutions. Let us emphasize that the glass is half full, that there are solutions. And to close, let me just show you a chart that reflects some of those solutions as identified by the Defense Department.

In their spectrum report, they went through and they said OK, here are all the current bands that we are using. If we had to move, where can we move, and they identified these bands. I want to be really clear and say that this is not like picking up and changing the place you park your car. That there is regulatory work that needs to be done. There is coordination that needs to be done. There is clearly lots that needs to be done. But they have identified where it can go. And what the industry is saying is that with this kind of a migratory plan that will solve the Defense Department's international interference problems, that will create capacity for domestic wireless services, and that will generate revenue to fund these movements of the DOD, and to make sure that the communications, instead of being the tail on the dog in military spending, is leading the charge, that is possible and that is the kind of win-win situation that we believe we can all work toward together. It is not going to be easy, but it is possible if we will all bow our backs. Thank you, sir.

Senator INOUE. Thank you very much, Mr. Wheeler.

[The prepared statement of Mr. Wheeler follows:]

PREPARED STATEMENT OF THOMAS E. WHEELER, PRESIDENT AND CEO,
CELLULAR TELECOMMUNICATIONS AND INTERNET ASSOCIATION

Mr. Chairman and Members of the Subcommittee: Thank you for the opportunity to appear before you today. I am Thomas E. Wheeler, President and CEO of the Cellular Telecommunications & Internet Association (CTIA) representing all categories of commercial wireless telecommunications carriers, including cellular and personal communications services (PCS).¹

As we look to the challenges of American national security at the dawn of the 21st century, it is increasingly apparent that our security is dependent upon not only traditional military capabilities, but also the strength of our economic competitiveness at home and abroad. We presently find ourselves challenged to upgrade military systems and to supply each and every one of our fighting men and women every technological advantage possible. We also find ourselves challenged to maintain our position as world leaders in technology, especially as the world prepares to debut the next generation of the wireless Internet. At few times in this Nation's history have the solutions to both these challenges been more closely intertwined.

Economically, the reason the United States leads the world in Internet technology and services is because we had a "home-field advantage" at the Net's inception. A well-developed Internet backbone enabled companies like Yahoo to test an idea and then go quickly to scale. Our international economic competitors, however, have learned from that experience and are seeking to build their own "home-field advantage" for the next generation of the Internet—the wireless Internet. In countries like Japan, Germany, Great Britain and France, the governments have made available blocks of spectrum for next generation wireless services that approximately double the amount of spectrum the U.S. government has made available to its wireless industry. Our competitors' plan is transparent: control the next generation of Internet

¹ CTIA is the international organization which represents all elements of the Commercial Mobile Radio Service (CMRS) industry, including providers of cellular, enhanced specialized mobile radio, personal communications services and wireless data services and products. CTIA has over 750 total members including domestic and international carriers, resellers, and manufacturers of wireless telecommunications equipment. CTIA's members provide services in all 734 cellular markets in the United States and personal communications services in all 50 major trading areas, which together cover 95% of the U.S. population.

products and services by giving non-U.S. companies access to the pathway necessary to deliver those products and services.

Militarily, there is almost uniform agreement that the new battlefield will increasingly be an information battlefield. Satellite infrared imaging, for instance, will enable soldiers to see behind the next hill. Real time intelligence updates and maps will show the enemy's latest positions. Leaders on the ground will have voice and data communications with superiors as well as with their own troops. Information superiority becomes a force multiplier for whoever is able to communicate best. Unless our soldiers are going to be dragging wires behind them as they deploy, these capabilities are all going to require the airwaves for their delivery.

The problem is that the airwaves that the rest of the world is allocating or otherwise plans to use for expanded wireless services are the very same spectrum that the American military utilizes for its communications. In the next 5 years the ability of the American military to deploy or train abroad will be compromised by hundreds of millions of consumers using wireless devices in the spectrum to which U.S. military radios are tuned. Already the growth of wireless technology abroad has begun to impact U.S. military capabilities. A recent Department of Defense analysis reported on the "nonavailability of alternate [spectrum] bands to provide the high-end frequency component" of command and control systems. The reason these airwaves were not available, according to the report, was the growth of mobile phones. Decisions already made by other countries have, are, and will affect our national security capabilities for years to come.

The seriousness of this situation was exemplified in the joint U.S.-Korean training exercise "Team Spirit" held in late 1999. In order for the U.S. radios to work, several channels of the Korean cellular network had to be shut down. According to a May 22, 2000 article in *Aviation Week & Space Technology*, "There are some U.S. weapons that currently aren't allowed to operate in South Korea out of fear they would interfere with civilian systems." No wonder Major General J. D. Bryan, Vice Director of the Defense Information Systems Agency, recently warned, "If we're not real careful, we face chaos in the wireless environment."

The U.S. military is a forward-deployed force whose international assignments will increasingly be hindered by the conflict between airwave assignments made at home and those made abroad. In a "double whammy" affecting both U.S. military and economic security, the governments of the world simply changed the rules. For the purpose of spurring Internet-related growth, they reallocated to wireless phone use vast amounts of the very same piece of the airwaves the U.S. military relies upon for its communications because that is what has been assigned to it here at home.

Fortunately, there appear to be solutions. Some solutions may be more costly than others—but not as costly to our national defense as losing the opportunity to modernize and upgrade older military equipment. Deploying new spectrum-hopping, frequency agile radios for both ground and air tactical communications could help solve some problems. By tuning across a wider band and then having the flexibility to jump from one frequency to another as conditions warrant, these new radios may solve the problem for our tactical ground troops and aircraft. An area requiring more patience is in satellite communications. With a fifteen-year average life, the lead-time for frequency changes in satellites is longer, but no less manageable.

At a time of concern over budget-busting defense spending, the world's reallocation into domestic U.S. military frequencies paradoxically provides a solution. Because the rest of the world is rapidly increasing the number of wireless users in these same frequencies, the U.S. wireless industry would like to use them as well. Should the Federal Government decide to reassign the military to other spectrum and auction these airwaves, the resulting billions of dollars could pay for both the move to new frequency and the necessary upgrades to strategic and tactical equipment. There are 95 megahertz (MHz) of DoD spectrum in the 1755–1850 MHz band allocated to mobile use by the rest of the world. A recent U.S. auction of spectrum blocks ranging from 25 to 30 MHz and covering only about 60% of the population, generated over \$17 billion from wireless carriers. The Department of Defense is sitting on a valuable domestic asset whose value can be utilized to help solve the military's international spectrum problem.

This debate over spectrum for advanced mobile services puts a spotlight on the urgent need for some fundamental rethinking of our nation's spectrum management process. We need to create more positive, market-oriented incentives for incumbent users to free up spectrum. And we need to create a more efficient spectrum management process that focuses more on policy goals than on constituent interests. That does not mean that we should ignore the important interests of incumbents, especially when they involve crucial national security requirements. It means we need to find creative, effective and timely ways of making tough spectrum management

decisions that leave all affected parties leaving the table satisfied that their interests have been addressed.

One immediate step Congress could take to advance these goals would be to pass legislation to ensure that the proceeds of an auction could be used by the incumbent to move sooner allowing the auction winner to immediately utilize the spectrum acquired. Normally this would entail using those proceeds to pay the relocation expenses of the incumbent, but in some circumstances the funds could be used to enable the incumbent to modify its equipment to share with the new licensed users. Congress might also consider earmarking an additional percentage of the auctions' proceeds for the incumbent user, to help give incumbents a positive incentive to turn in spectrum for auction. If incumbents were guaranteed that their needs would be accommodated and paid for, and that they could obtain some additional revenue as well, they would have a greatly increased incentive to turn back spectrum that could be auctioned. The result in the long run could be not only more efficient spectrum management, but higher revenues for the U.S. Treasury. In this particular instance, I believe it absolutely imperative the Congress guarantee DoD reimbursement funding and additional monetary incentives to move, with funds, to modernize and upgrade DoD capabilities. The test should be to maintain and enhance capabilities—not fall on your sword for a piece of spectrum that will be compromised by the decisions of other nations.

This kind of “win-win” requires the implementation of a rational spectrum policy. Unfortunately, the United States does not have the kind of spectrum policy that would facilitate either this evolution, or taking advantage of the potential funding mechanism. In fact, the U.S. has no spectrum policy that can effectively deal with such a multi-faceted problem. What has passed for spectrum policy has been budget policy decisions about when to sell pieces of the airwaves in order to generate funds for the Treasury. As the Defense Department's Defense Science Board has observed, the system is broken. That unfortunate situation hurts both military capability and economic competition.

The seriousness of the spectrum issue to American combativeness and competitiveness calls for dedicated solution-oriented efforts by both the defense community and the wireless industry. Denying the economic viability of next generation wireless services in hopes of forestalling the inevitable need to deal with the spectrum crisis is not a solution. New technologies never come forth without hiccups. The military saw this with the Patriot Missile, Tomahawk Cruise Missile, Abrams Tank and Osprey aircraft, and the same will be true of the new technology of the wireless Internet. History's message is clear: those who place their bets against technological advancement are “betting on a nag.”

The wireless industry is most fortunate that this Administration has taken several bold steps to correct a decade-long refusal to make tough decisions. Secretary Evans just last week directed the National Telecommunications and Information Administration to work with the FCC to develop a new plan for (3-G) advanced mobile services. Secretary Evans even suggested flexibility in the statutory auction dates for 1710 to 1755 MHz and 2110 to 2150 MHz may be necessary to implement the new spectrum plan. Additionally, over the past 3 months, various Executive Branch agencies have been brought together under the able direction of the White House NEC and NSC to address the spectrum problem. The White House attention to finding a solution to this decade-old problem has been most helpful. The industry is encouraged that some of the best and brightest minds in the Administration are committed to finding a solution that is good for the economy and our national security.

An opportunity appears to exist to demonstrate the good faith possibilities of cooperation in the evolution to new military technology and continued wireless competitiveness. In recent Capitol Hill briefings the Defense Department indicated that approximately half of all the Department's spectrum usage for fixed wireless applications is by the Army Corps of Engineers to do remote monitoring of water levels, alarms and dams. Tying up that spectrum for intermittent services that take a quick reading and then report a data burst is not only spectrally inefficient; it is probably also overly expensive. Throughout America, the wireless industry is providing the exact same services on a commercial basis. If the grocery chain Albertson's can use commercial wireless networks to monitor and control electricity in their stores during the California power emergency, the same should be true for the Corps of Engineers to monitor water levels. What's more, buying a shared service will no doubt be much lower cost than building a stand-alone system with its own allocated airwaves. That spectrum then can be sold and the proceeds put into a Defense Department-only trust fund for the purpose of paying for the next spectrum move (which, in turn, will generate more auction revenue), and for the new technology to assure information dominance on the ground, in the air and at sea.

Right now we are at a unique point in time. Most countries are reducing their monetary commitments to their military. No other country in the world has the available resources, technological know-how and the opportunity to up-grade military communications capabilities to 21st century systems. The U.S military has it within its grasp and ability to do what no other country in the world can do in the current environment—deploy digital end-to-end encrypted state-of-the art communications capabilities. Now is the time to seek a better defense—and a better economy. Unless we act now things will only become more confusing and more intractable. We must not fail to seize upon the win-win opportunity before us—a second rate communication system is no real option for a world leader.

Senator INOUE. Mr. Cooper.

**STATEMENT OF MARTIN COOPER, CHAIRMAN, CEO,
AND CO-FOUNDER, ARRAYCOMM, INC.**

Mr. COOPER. Thank you, Mr. Chairman. Members of the Subcommittee. It is really a privilege for me to be here before you today, and especially in light that we share the fact that I have spent a career of almost 50 years working on spectral efficiency and having a distinguished group like this looking at this matter is a source of great pleasure to me. It is also a great pleasure to be the last on this agenda so that I can explain to you what my distinguished colleagues really meant to say.

Let me start by first urging the Subcommittee to ignore the technical gobbledygook that the wireless industry, myself included, have deluged you with in the past years. I want to focus on what your real agenda is. That agenda is the granting of rights to a national nonrenewable treasury, the radio frequency spectrum. You have the obligation to see that all the users of the spectrum collectively serve the public, all the public and any result in the way that you allocate that spectrum and excludes important constituencies, the public is simply wrong.

When we created cellular some 30 years ago, what we envisioned was a personal, portable telephone service that unshackled all people from the wires that tied them to their homes, to their workplaces. We knew that wireless could deliver high-quality speeds at low cost with good reliability to all people.

Further, we promised the FCC, and I was there, and I remember this, that cellular technology was capable of continuously improving spectral efficiency. Allocate 40 megahertz to us, we said, and we will grow the service indefinitely and we will never come back for more. Well, we did come back for more. That initial 40 megahertz has grown to 170 megahertz, and here we are asking for more.

Today, if the industry, if the wireless industry proposed to serve all of the personal traffic in the United States, that was our dream. People on the move really do not want to talk about wires on telephones, they want to talk on personal phones. And if you put all of that traffic on wireless service using today's technology, you would use all of the existing spectrum. You would use 2,000 megahertz of spectrum and that allows no room for further growth and it allows no room for all of the various classes of data services that it will consume many times more spectrum.

So that is the real problem of the Subcommittee. If you rely on today's technology, the need is not just for another 100 or 200 megahertz. The demand is for another 2,000 or 4,000 megahertz, and that spectrum simply does not exist. The cellular vision that

we had 30 years ago remains incomplete today. Cellular serves some segments of the population very effectively, others poorly, some not at all, so what is the answer?

The only answer is new technology that not only improves, that multiplies the spectrum capacity. Technology has come to the rescue in the past, properly stimulated, properly stimulated, it will come through again and that stimulation is the crucial role of this Subcommittee of the Congress, of the FCC, of the Department of Commerce. I want to give you some examples, because I was fortunate enough to be involved in three successful government industry collaboration in the past. And the process really does work. In each case, in each of these cases, the FCC said that new spectrum would be made available to industry, but only if the industry could provide new ways of using that spectrum. New spectrally efficient ways of doing it.

The industry responded in the 1960s, paging systems were developed that could serve 100,000 subscribers in the same A spectrum that previously only hundreds of subscribers could be served. In the 1970s, the special multiradio service was created, SMRS. The concept of trunking was introduced into land mobile and that multiplied the spectrum capability for land mobile in excess of 10 times and in the 1980s, cellular technology brought public switch service to thousands of subscribers on every radio channel that previously had only served 100 subscribers and in every case, it was technology that came to the rescue. In every case, there was a magic bullet, and who stimulated the magic bullets? The vision of bodies like the FCC and this Subcommittee, and here we are again.

I suggest that cellular technology needs to be refreshed. The new technologies are the basis of that refreshment, and these new technologies are ready and waiting and 3G alone does not do that. 3G itself is not a new spectrally efficient technology. And there is a magic bullet, and that magic bullet, it was referred to by the gentleman from the Department of Defense, Dr. Wells, is the adaptive smart antenna. Adaptive smart antenna array technology, adaptive smart antenna array technology has improved. This is not theoretical. It has been proven to multiply the use of the spectrum by not just a few times, not just by percentages, but by tens of times. It has been proved by the deployment of some 90,000 base stations throughout the world today, mostly in Southeast Asia and the Middle East, and the nature of that technology was, had its source ironically enough in our own Defense Department years and years ago.

Properly stimulated by the continuing oversight of Congress and the FCC, this kind of technology cannot only resolve the spectrum challenge, but it can also get American technology back into the leadership role that it deserves.

So I want to close my remarks with my vision of the personal wireless future. It is a future where technology becomes invisible, where the consumer reigns, where the citizen reigns, where consumers of all kinds from teenagers to seniors to city folks to small towners, from techie early adopters to a heart patient whose life is saved by one burst, where all of these people and our defense forces have access to all of the radio spectrum. Technology can make that

happen. You, Senators, have the power to make that real. Take your time and do it right. Thank you very much.

Senator INOUE. Thank you very much, Mr. Cooper.

[The prepared statement of Mr. Cooper follows:]

PREPARED STATEMENT OF MARTIN COOPER, CHAIRMAN, CEO, AND CO-FOUNDER,
ARRAYCOMM, INC.

Mr. Chairman and Members of the Subcommittee, thank you for the opportunity to appear before you today. I commend you for holding this hearing on spectrum management and Third Generation (3G) wireless—two critical issues facing the wireless communications industry today.

My name is Martin Cooper. I am the Chairman and CEO and Co-Founder of ArrayComm, Inc., a U.S.-founded and based technology company headquartered in Silicon Valley, California. We founded the company in 1992 and now have over 200 employees including many renowned scientists, engineers, and industry leaders in the field of wireless communications.

Today, I would like to present my views on spectrum allocation, including how we can ensure that our nation's scarce spectrum is put to its most valuable use, and the need to encourage new technologies and the timely deployment of these technologies to *all* Americans. While these technologies originated in American laboratories and were often paid for by the Department of Defense, ironically, many are more widely deployed abroad than here at home.

Wireless personal communications have contributed importantly to the productivity, safety, and convenience of people in this country over the past 60 years, but especially during the most recent 18 years of commercial cellular service. I would like to share with the Subcommittee the vision that inspired the creation of cellular service, to express an opinion on how well we have done in fulfilling that vision, and to project that vision into a future that includes the Internet.

Specifically, I would like to make two points relative to this Subcommittee and its role in overseeing the Federal Communications Commission (FCC) and the Department of Commerce:

1. Despite enormous progress in the personal communications industry, that industry is still in its infancy. Future services will require 10 to 20 times the spectrum allocated today. That spectrum just does not exist—*unless* the industry continues to aggressively adopt new technology that *multiplies* capacity of existing spectrum.

2. 3G is one of a number of new personal communications services, each of which will serve different constituencies who have different needs. All of these services need to be accommodated in the fixed amount of spectrum that is available as limited by physical laws.

When we created cellular 30 years ago, we envisioned a personal portable telephone service that unshackled people, *all* people, from the wires that tied them to their desks, their homes, and their workplaces. We knew that wireless technology had the capability of delivering high quality speech, at low cost, with good reliability to all the people. And further, we promised the FCC, which was a crucial participant in the creation of cellular service, that cellular technology was capable of continuously improving spectral efficiency. "Allocate 40 MHz," we said, "and we will grow the service indefinitely."

Despite the enormous strides made by the industry and the FCC—and without question, there has been progress—the cellular vision remains incomplete today. Some segments of the population are served effectively, others, not at all. Data over cellular pales in comparison with data over wireline. Despite the obvious convenience of wireless service, those of us who use the service still suffer from the lower reliability and higher cost that characterize wireless compared to wired service. As a result, although over 100 million people in the United States use cellular service, they still, on the average, use old-fashioned wired phones for over 90% of their talking and over 99% of their Internet access.

The initial 40 MHz of cellular spectrum has grown to 170 MHz and here we are, asking for more. Consider that, with today's technology, if the industry proposed to serve all personal traffic, the FCC would have to allocate virtually *all* of the usable spectrum to cellular service to the exclusion every other defense and commercial service. Not to mention, I add, the demand for new classes of data services that will consume, again, with today's technology, far more spectrum than voice services.

And that is the real problem faced by this Subcommittee. If we rely on today's technology, the need is not for just another 100 or 200 MHz, the demand is for another 2000 or 4000 MHz and that spectrum simply does not exist.

The *only* answer is new technology that multiplies spectrum capacity. Technology has come to the rescue in the past and, properly stimulated, it will come through in the future. It is that stimulation that is the crucial role for this Subcommittee, Congress, the FCC and the Department of Commerce. There are industry standards for automobile fuel efficiency—why are there not standards for efficient use of the radio spectrum? We have huge reserves of fossil fuels—but only about 2000 MHz of spectrum that *is* useful to connect people.

The message is clear. The demand for more services is going to accelerate. People are learning the value of freedom from the wired tether and that freedom is every bit as important for the Internet as it is for plain old voice service. The only hope for providing this new freedom is continuing technological progress. We must, and will, continue to extract more and more value from the spectrum, just as we have been doing for the hundred odd years since radio was invented. We must ensure that our nation's scarce spectrum is put to its most valuable use, to enable U.S. telecommunications companies to meet consumer demands, and remain competitive globally.

The wireless industry today stands at a crossroads. The momentum of the past 18 years has made mobile connectivity a part of our lifestyle. But, this is just the beginning. The next 20 years offer even greater promise for the American public and the American economy. But the mission has expanded. We started with voice. The technology of the entire communications world is now *data*. Voice is now just one of many applications that must be served within a limited amount of spectrum and voice is fast becoming a minor part of the demand. The Subcommittee Members know, I am certain, that I raise these challenges only because I am confident that solutions exist for all of them and I will touch briefly on those today.

Let us look at the issues that this profound change of mission raises.

A BASIC AND SCARCE RESOURCE: THE SPECTRUM "SWEET SPOT" FOR MOBILITY SERVICES

There is a "sweet spot" for the frequencies allocated to mobile wireless systems, influenced by the physics of radio-communications, which extends from about 500 MHz to 2500 MHz, or about 2000 MHz in total. The size of this sweet spot cannot be expected to change dramatically over time. We must accept that there will always be competing interests for this spectrum, all in one form or another important for our country. The decisions made on 3G spectrum must include a comprehensive approach to all spectrum allocation in this range of frequencies or the problems we face today will resurface every few years indefinitely.

Today, the cellular industry uses about 170 MHz of spectrum between 850 MHz and 1.9 GHz, or 8.5% of the 2 GHz sweet spot. Let us assume that an additional 140 MHz (located between 1710 and 1850 MHz) is allocated to the cellular industry, and its share of the sweet spot goes to more than 15%. Without passing judgment on whether this is an equitable allocation of the sweet spot for this very important industry, it is clear that the amount of spectrum available for commercial mobile wireless cannot continue to increase without limit, given all of the other demands on the spectrum—other commercial, scientific, public safety, aviation and defense interests which consume a considerable portion of the rest of this frequency range.

NEW SERVICES ARE MORE SPECTRALLY DEMANDING

Compounding the difficulty is the fact that many of the new services that may be desired by the public and are contemplated by the cellular industry require more bandwidth than today's voice and low-rate data services. The critical issue here is the price at which wireless operators can afford to offer new services to consumers. The techniques that are most effective at using the spectrum better and improving spectral efficiency also reduce deployment and operating costs for the carriers that use them.

Efficient use of the spectrum can lower an operator's costs and bring wireless services to constituencies that would otherwise not be served.

Without adequate spectral capacity, there is a risk that advanced services will not be available to the public at a price-point that most Americans can afford. Congress has already heard from some wireless carriers that spectrum shortages could cause their companies to increase their prices for cellular voice service. Of course, this is true using 30-year old technology. But there are technologies in widespread use today that have the opposite effect and carriers will soon have access to these technologies—if they are encouraged to adopt technologies that use spectrum more efficiently, rather than to solve capacity demands with more spectrum.

There will be no benefit from 3G services to the American economy if they are not affordable.

ARRAYCOMM, INC.

ArrayComm, Inc. is the global leader in fully adaptive *smart antenna*-based wireless communications. Our technologies are independent of the air-interface. They can work with *every* generation of cellular deployment; in fact, with any personal wireless communication system, and we license that technology to manufacturers of wireless communications equipment.

ArrayComm has created one of the key technologies that will form the basis of the rescue that I just alluded to. Our technology, called IntelliCell, is an advanced form of smart antenna technology that is technically called adaptive array processing. A traditional cellular base station blankets a wide area with radio energy. Our smart antenna technology directs that energy to the person for whom it is intended and avoids putting energy in locations where it could interfere with others who wish to use a radio channel. This technology can be applied to any personal communications system. The result is an increase in the number of users, lower deployment costs, higher profitability, fewer dropped calls, faster data rates and improved customer satisfaction.

There are, today, over 80,000 cellular base stations using this adaptive smart antenna technology serving many millions of people in Asia and the Middle East. In these developments, we have created a nine-times improvement in spectral efficiency over systems that were already using advanced technology. That is effectively multiplying the spectrum used in those systems by nine times. These systems are capable of serving nine times more people than earlier versions that did not incorporate adaptive smart antennas.

Our patented IntelliCell technology (also known as a fully adaptive “smart antenna”) uses advanced software and antenna arrays to continuously optimize, in real time, the communication channel with every wireless user. IntelliCell dramatically enhances the quality, capacity and overall performance of wireless voice and data networks across all air interface standards. IntelliCell multiplies spectrum re-use by creating multiple spatial channels on top of traditional time-division and code-division multiple access methods used for voice and data transmission, thereby reducing the need for spectrum. IntelliCell technology is deployed in over 80,000 cellular base stations serving millions of commercial customers principally in China and Japan, as well as other Asian countries. This technology is not a vague future promise—it’s proven, real, and widely used—but not yet in the U.S.

ArrayComm created a new service, *i-BURST*, in an effort to demonstrate the principles of our spectrally efficient technology and to offer new services not available today to constituencies that are not served effectively today. *i-BURST* is a wide-area, high-speed, portable, wireless Internet access system. It is very efficient in terms of spectrum use, and can be deployed at significantly lower cost than generic 2G and 3G cellular data systems. *i-BURST* can provide each user anywhere, with an always on, Internet connection at data rates in excess of 1 Mbps per user, even in a fully loaded network. Operating on as little as 5MHz of unpaired band of radio spectrum and using time division duplex (TDD) transmission technology, *i-BURST* can bring high-speed wireless Internet access to people at far lower cost, by orders of magnitude, than systems designed for other purposes. Perhaps most importantly, its performance and its affordability make it a candidate for an array of applications of immense social value, such as tele-education and telemedicine, which may unfortunately not be served by standard commercial wireless systems.

ArrayComm is also working with U.S. and international standards and regulatory agencies to increase their awareness of how strategic spectrum allocations and the use of technologies like spatial processing can maximize the value of spectrum and enable the wireless industry to meet consumer demand.

On a larger scale ArrayComm is also a charter member of the TDD Coalition, which is a group of like-minded U.S. and international companies, all with applications and services built on the TDD technology platform. The Coalition was founded earlier this year to: (1) promote TDD technology for wireless broadband products and services; (2) promote TDD technology into market and regulatory environments for broadband wireless; (3) inform the industry about TDD technology, and its benefits to the global broadband wireless industry; (4) pool promotional resources to develop common marketing approaches as they relate to TDD; (5) inform and educate international and national regulatory bodies to ensure that technologically neutral rules are adopted to allow economical deployment of TDD technology for broadband wireless access; (6) create a collaborative industry voice to address issues relating to TDD; (7) develop implementation guidelines that will allow TDD deployments and insure harmonious coexistence of TDD with other duplexing systems; and (8) support TDD within global, regional and national standard organizations.

The TDD Coalition believes that policy makers and regulators can benefit from the Coalition's contributions, and perhaps most importantly, appreciate that there are many companies worldwide that are developing leading edge, spectrally efficient applications and services on the TDD technology platform. Commercial deployment of these applications and services will bring innumerable low cost, advanced data and voice applications and services to consumers worldwide.

WHAT CAN THE GOVERNMENT DO?

What can the government do in the face of the fundamental limits on mobility spectrum? I suggest that the government can do the following:

1. *Empower the FCC to reexamine all spectrum allocations, in light of what can be done with new radio technologies and the Internet.* The FCC and the Department of Commerce are currently doing the best that can be done in a very complex situation; handling an impossible task of satisfying so many constituencies. Commerce Secretary Donald Evans and FCC Chairman Michael Powell have demonstrated a commitment to make sufficient spectrum available for advanced wireless services. They have also acknowledged that time is needed to study options to develop a new 3G allocation plan that best serves the public. As they reexamine the issue, I encourage them to develop a more unified approach to spectrum management that offers long term solutions for serving *all* Americans with a wide variety of voice and data services more efficiently. Just as the Subcommittee did under the Chairmanship of Senator Inouye and the leadership of Members like Senators Hollings, Stevens and Burns, nearly 10 years ago when it carefully reviewed the feasibility of auctioning radio spectrum, so too should it carefully explore spectrum allocation and encourage the efficient use of spectrum by licensees.

2. *Put the public first.* The wireless industry has been focused on technology (illustrated by the myriad of acronyms such as CDMA, 3G, WAP, etc.), and is driven by delivering voice services. We need to challenge the industry to find the right solutions that will genuinely serve the masses with the Internet, which is a compelling matter for the telecom industry today. This will define an inclusive approach; to serve the elderly—the disabled—teenagers—the police-rural America. To serve all of the billions of people in the world who do not fit the profile of the traditional cellular subscriber.

3. *Hold spectrum users accountable.* Many companies will indeed need new spectrum, but we must first ensure that we are all using the spectrum we have to its highest spectral efficiency. After all, there are fuel efficiency standards for cars, and planes, why should there not be efficiency standards for spectrum use—a finite national resource? According to what I call Cooper's Law, there could even be spectral efficiency timed goals. For instance, the reason we provide more spectrum fast has little to do with international standards, but much more to do with potential demand. Like with any infrastructure requirement, when the demand is here, you do not start a new technology, you do more of the same (*e.g.*, when traffic jams become widespread, county authorities will first widen the road, and at some point prepare for mass transit). The most obvious thing to do, however, is to make sure that we—the industry—use as efficiently as possible the spectrum we have been allocated.

4. *Foster new radio technologies with inherently higher spectral efficiency.* New radio technologies have been developed in the past 10 years, which are drastically more spectrally efficient than the technologies used in cellular systems today, which are all evolutions of the standards developed 30 years ago. Built from the start to accommodate the Internet Protocol, they are eminently suited to carrying very affordably the new services that the public requires. ArrayComm is just one company that has developed technologies that can increase spectral efficiency. Neither Congress nor the FCC should be in the business of mandating technology or services. However, they can very well define guidelines to foster or specify minimum levels of spectral efficiency in radio systems. Suitable allocations of TDD spectrum in the overall 3G allocations would foster their quick adoption and deployment.

5. *Promote "real" competition at home and abroad.* Without real competition we will not have much in the way of creative new services. Other countries are stimulating innovation and rolling out new mobile services because they have allocated spectrum for these services. We too would like many of these services at home. But to do so, the U.S. must allocate spectrum for these new services. Since this has already been done overseas, in one sense we are already behind.

6. *Avoid the trap of the "universal solution."* Universal gadgets that purport to do all things for all people do not do any of them well. There is no Holy Grail of solutions. People have different needs. They will need different devices and services to satisfy those needs. Future Americans will have lots of choices for their personal communications devices and services but all of them will interconnect. There will

not be a universal network. Some networks will be optimized for voice and some for data. Some will be for travelers who need to communicate all over the world. Some will just service a neighborhood or small community.

Chairman Powell and the FCC have been supportive of the initiatives regarding spectral efficiency, TDD and new systems to serve the public. The FCC has provided ArrayComm with experimental licenses to test its technologies. If 3G allocations occur, as they have elsewhere, they will embrace both FDD and TDD spectrum and this will provide for the competition that is crucial to successful consumer services.

THE FUTURE

Despite the fine progress in cellular and other personal communications services in recent years, we have experienced only a glimmer of the impact that these services will have in the future. Delivering bandwidth to people has always increased their awareness of the world. Making high interactive bandwidth available at very low cost will have a profound effect. The practice of medicine, for example, will be very different, and far more effective, when a doctor can diagnose a patient remotely and immediately when the patient is sick—not when the patient can make an appointment. The days of delivery of music by CD, by cardboard and plastic, are numbered. Someone will develop a way to pay the artists and distributors and their choice of music will be delivered to people when they want it. The workplace will expand to be anywhere that the worker wishes to be and instant collaboration, enhanced by the ability to see and hear (and why not touch, smell and taste), will be a way of life.

The Internet will be truly meaningful to people only when it can be delivered wirelessly, at low cost, and with broad bandwidth. Efficient spectrum use will make that possible and will make the Internet a tool for everybody beyond the early adopters and “techies” who use it today.

Bandwidth Is Awareness And Mobile Bandwidth Is Freedom.

I thank the Chairman and Members of the Subcommittee for this opportunity to express my views today.

Senator INOUE. Mr. Wheeler, on one of your charts, you showed a lot of green, a little red, and you spoke of lack of harmonizing. Now, could all the countries covered in green come to some agreement for the use of certain technologies is that they became harmonized?

Mr. WHEELER. There is the difference between the issue of technology harmonization and spectrum harmonization. What they have all agreed by making individual decisions is to harmonize the spectrum. There are different kinds of technologies that are sometimes used within that spectrum.

Senator INOUE. So it is not a conspiracy against us?

Mr. WHEELER. Senator, you know, there are some who have said, let me put it that way, OK, there are some who have suggested that knowing that that is red, and that that is where the Defense Department sits domestically might be a great competitive place to go in the rest of the world, and place on our own target, if you will. I am not suggesting that. I am reporting what others have suggested.

Senator INOUE. You have sat through and listened to testimony of the first panel, gentlemen. I concluded from listening to them that they want more time. I think most of you said time is of the essence. We must act promptly. Do you have any thoughts on the testimony of the three witnesses?

Mr. STRIGL. Mr. Chairman, if I may. First, sir, the time is clearly of the essence. Senator Brownback a few minutes ago talked about the, what I would call the spectrum exhaust in some of our major cities. The comments that the Senator made are quite true. In major cities across the United States, at current course and speed, considering the growth of the wireless customers, the growth in

usage that we have seen, we will see and exhaust major cities in New York and Los Angeles in 18 to 24 months. Included in that estimate is a move to more efficient technology, so I think it is very important if we act now, sir.

Mr. MCHENRY. If I might, we do not take a position on how rapidly the current cellular or mobile wireless carriers may need spectrum and that varies from market to market in the services that are offered. I would echo that time is absolutely of the essence. As I mentioned in my oral testimony, the ability to finance our company and roll out the broadband services has basically been held hostage to the proceeding that began in the fourth quarter of last year, and so I just couldn't emphasize enough that the studies have been made; the interim reports have been made; the final reports have been made, and that while there may be some need for a smaller amount of time or some additional time to study the issues that Mr. Wheeler described in developing a detailed plan, that process means certain delay and possible fatal delay to the roll out of broadband services in rural America.

Mr. WHEELER. Could I piggyback on that, Mr. Chairman? Let me just repeat one of the—and that is that we recognize that the only logical way to deal with this challenge is over time. And as I said in my testimony, nobody is asking to have 200 megahertz dropped in their laps next Thursday. But we need to start a process with a plan, a plan that helps DOD and other government agencies understand what they need to be planning for, a plan that tells Mr. Strigl and Mr. Kelley and others what they need to be thinking about, and then we can go at it in pieces over time. And the beauty of going at it in pieces over time is to Senator Stevens point a minute ago, it also happens to then fund the next piece. Because if you set up a trust fund that is funded by the first auction, and that trust fund can only be used to clear the next piece of spectrum that will be auctioned, and that means not only moving to new areas, but having the equipment that goes with it, then an amazing thing has happened. Two things have happened.

No. 1, you have speeded up the move because you had a planned process, and No. 2, you have created an incentive for the government because spectrum that has been cleared, which is what this trust fund would pay for, is more valuable than spectrum that you have to buy and then wait to have cleared. Time, value, money issues. And so yes, there is a process that we can go through that will take time, but it has to start. There needs to be some pump priming, if you will, and that pump priming can be a much smaller piece of spectrum, but the pump has got to get primed.

Mr. COOPER. Allow me to address your earlier question about response to the people of the Department of Defense because I was quite startled to hear that they had allocated some \$50 million to look at more spectrally efficient techniques for Defense. My company is looking at one very narrow area. We are looking at how to apply the smart intent technology I told you about to cellular systems like 3G and Internet access systems, and we have raised something in excess of \$140 million of venture capital and by the way spent almost all of it just for this one narrow area. It is clear that the comment that one of the Subcommittee Members made is correct. I think it was you, Senator Stevens. These people are not

looking at this as a trillion dollar problem. Because if you have a trillion dollar problem, which I am certain this is, you spend a lot more than \$50 million.

With regard to the issue of the timeliness, 3G, first of all, nobody really knows what 3G is. 3G has become one of the gobbledygook words, but there are at least four different versions of 3G expanding around the world today. Some of them share different frequency bands. 3G really is a collection of future technologies. The 3G systems that have already been started to be introduced are so complex that there are none in true operation today. AT&T who ostensibly is the word leader, was supposed to start service in July, have delayed their service to October, and are now talking about June. 3G is not the solution for Mr. Strigl's customers for the next 3 years. The only thing that is going to help, and by the way, I know Mr. Strigl is working on this area is to use spectrally efficient techniques that take care of today's customers.

Mr. KELLEY. Thank you, Mr. Chairman. I would echo completely Mr. Cooper's comments with regard to efficient use of spectrum, and we have heard many people refer to that here today. It is critically important. But there are some, with regard to time, how quickly we have to move, how urgent it actually is, and particularly in regards to the comment Mr. Cooper just made about the leaders outside his country who made big announcements and spend in Europe anyway close to \$100 billion on licenses. Those technologies have not yet been deployed. In fact, they have been delayed several times so I would be hesitant to suggest that we should rush into it any way doing something similar so that technologies are rushed out to deployment before they are ready, before we know they really work, and it really is the best use of spectrum, No. 1. The second thing is, do we really know how every hertz of spectrum is being used in this precious mobile band that is about 2,000 megahertz wide, what it is being used for in every city? A large A spectrum that has been allocated in other parts of the world is really not being used at all today. We understand, and a lot of cities and the one that we are in right now where our company is based, we are not able to offer service. There is no spectrum available for us there. But there is the same 180 megahertz available there and probably 120 megahertz actually being actively used. I do not know how much of that efficiently, and that is an estimate. There are just so many unknowns and the time definitely is right to examine the issue because it is very important, it is very timely, but I think it is worthwhile taking time, looking at what protects consumers, in fact, all Americans the most effectively, and what's in the highest national interest in terms of use of the spectrum.

Senator INOUE. It would appear from the testimony that DOD spectrum is the key to what we are discussing today. DOD has indicated that it is not quite ready. GAO, our most respected agency, as far as the Congress is concerned, they set our agenda, as indicated, that they are not quite ready to report.

What do you suggest we do, this Subcommittee?

Mr. WHEELER. Mr. Chairman, I think there are two things that we have to look to you for leadership on. The first is that there needs to be a spectrum policy in this country. One of the reasons that we are in this hole is that there is no spectrum policy. Our

spectrum policy has been budget policy. And how much spectrum do we have to auction off to raise how much money and it is where we grab it from. We do not have a plan. We do not have a structure for getting to that plan, and so that is the first thing, and that is something that I believe exactly is under the jurisdiction of this Subcommittee.

Second, we have got to have, we cannot sit around and contemplate the perfect plan at the cost of priming the pump and getting the spectrum process started. So what we would urge this Subcommittee to do is to start down both of those paths and to act expeditiously on both so that we can begin to have a national spectrum plan and a component of that can be the beginning of the auctioning off of internationally harmonized spectrum for wireless use.

Senator INOUE. Mr. Strigl.

Mr. STRIGL. Mr. Chairman, if I may. There are a number of things that I would encourage the Subcommittee to act upon. First is not necessarily only the relocation from DOD spectrum, but an overview, a plan, to identify over time, as Mr. Wheeler had suggested, a total of 200 megahertz, but there are some pieces of this that I think are extremely important that I would encourage the Subcommittee to consider.

First of all, to set times on how the spectrum is cleared, and when the spectrum is auctioned. We have been hurting in this country because we have auctions that keep moving. We have auctions that mention spectrum with no intentions of clearing it. And then finally, I think that there is a clear need to identify the mechanism by which those who are relocated, whether it is the Department of Defense or others how they are reimbursed for that relocation.

Mr. KELLEY. Thank you, Mr. Chairman. As I was saying a moment ago, my recommendation to the Subcommittee would be to do a review of how all of the spectrum is being used today by all of the people who have the rights to use it, starting with those of us who are using it for commercial purposes, but including to the extent it does not compromise security, the use of the military, and the use by education and religious organizations and so forth to understand how much it is actually being used, where it is being used, and finally how efficiently it is being used today.

Mr. MCHENRY. Thank you, Mr. Chairman. I would say that the two things that I would recommend that the Subcommittee consider would be the fostering of the spectrum management policy—overall spectrum management policy referred to by Mr. Wheeler, and I do suspect that that is going to take some time and further study and fact finding, and second, to begin to narrow the choices that are being looked at for 3G because it does have collateral effects on others, as I have described earlier, but to keep all potential 3G bands in play I think is unreasonable and I would urge the Subcommittee to foster the narrowing of options in the beginning of the process of negotiating and developing that interim plan.

Mr. COOPER. Mr. Wheeler is right. The Congress has to create a spectrum policy, but I think that spectrum policy has been made clear. It has got to be a long-range policy because as powerful as this group is, there is absolutely nothing that the Congress or the FCC can do to make spectrum suddenly appear in anything less

than the timeframe of 7 to 15 years. The people that address this problem from the Department of Defense are sincere, and if in fact they were spending the kinds of money that I think Senator Stevens thinks are appropriate, it would still take a substantial amount of time to bring satellites, establish new satellite systems and to create these new things, so my suggestion remains the same. No. 1, establish an appropriate policy. No. 2, that policy must embrace some criterion for giving spectrum to people, and that is when you make a spectrum assignment, it ought to be to someone who knows how to use that spectrum in a better way that has been used previously.

Senator INOUE. Mr. Burns.

Senator BURNS. Thank you, Mr. Chairman. We have been monkeying along here and it is pretty close to supper time. I have not missed a meal in my life, and I do not plan to yet. Interesting comments about the efficiency of the spectrum. Mr. Strigl, I understand your call for more spectrum, and all of that, and facilitate some new stuff and services that you want to offer the American public, but last week, you applied for an extension or a waiver of the timeline of E 911, and we have already granted an extension from March 1 until October 1st of this year. And I think that I speak for all the Members on the Subcommittee that supporting the communications needs of the country is very vital, and I would also, in the emergency area, the police first responders. Supporting these kind of rescue personnel is one of the most important public duties that the FCC and our Subcommittee has. That is one of the high responsibilities. Would you agree with that?

Mr. STRIGL. Yes, sir.

Senator BURNS. I am saying that even though you are asking for more spectrum, we cannot—and 3Gs especially—we cannot get you to go ahead and deploy what we think is a vital, vital public service situation. In other words, let us get the conversion done. Why do we need another extension?

Mr. STRIGL. Senator Burns, let me please explain that we have spent tens of millions of dollars deploying E 911. We have people who do nothing but focus every working day on E 911. My company has asked for a waiver of months to be sure that what we are deploying works well and helps save lives. I may point out, sir, that if we look at the number of requests that we have received—not on phase II, but on phase I of E 911, number about one-third, only one-third of all the thousands of PSAPs that exist across the country, public answering points.

On phase II of E 911, which identifies specific—pinpoints specific locations—we have received very few requests across the country, but we are complying and we are asking for a shift of months, not years. And if I look, Senator Burns, at the PSAPs within the State of Montana, for example, that have requested service, we have had no requests whatsoever. So what I do not want to have to do is deploy a technology that sends a signal nowhere. There is much more work, sir, that needs to be done. I commit to you that we are doing all we can to put it in place as quickly as we can across the United States.

Senator BURNS. That sort of distresses me, because a lot of people put off their requests until they need it. And I would hate to

see that happen, but that does distress me, and I know that we, especially Montana, I just think it is vital for us. I just think even though our first responder and our emergencies, we stand well nationally, but we still have got a lot of space to cover in order to tend to some of those situations. I am interested in Mr. Kelley's comments today really that the demand for more spectrum right now probably is just tepid at best with using your technology. Why do you think, Mr. Kelley, that other companies that are in your same business are not getting the efficiency out of their spectrum that you are?

Mr. KELLEY. Well, as Mr. Wheeler pointed out, Verizon Wireless, Sprint PCS and others are using the same technology, CDMA, are using the same technology developed in the United States. We have deployed the newest technology. We are using it incredibly efficiently. 100 percent of our customers are using the new efficient technology. Those types of statistics are things that I do not know firsthand how the other carriers are doing it themselves. Some carriers who are represented here today have a number of different technologies that are considerably less efficient than the ones that we are using, and one exception that I would make that there are some markets that are here in the United States, specifically like New York City, for example, or here in Washington, where the population density is similar to that, as it is in other countries such as Europe and Asia, and in those kinds of areas, using more spectrum than the 10 or 15 megahertz that we have where we can serve up to 20 percent of the population with unlimited use would be a challenge and, in fact, may be downright impossible. We do not believe, based on our studies that require even more than the spectrum limit of 45 megahertz today or even beyond that, however, we do not have firsthand knowledge of doing that.

Senator BURNS. Well, it is like I said a while ago. We have a study that will be completed in November. We are going to be putting together legislation to deal with a spectrum policy, Mr. Wheeler, but we think that we have got to gather a lot more information and we have got to do our homework, especially on the Subcommittee with the Members, and also with the industry before we even start to move any kind of piece of legislation. In other words, bring it together, not only from an inventory standpoint, but our relationship with our international community, and have some sort of an idea before we start shaping legislation, so would you have any comments? I would ask the panel. Where do you think this wireless industry will be in 20 years? In 20 years, what do we do now to realize or to get us where you think we will be in 20 years?

Mr. WHEELER. Senator, we are fishing for that ITU chart to put it back up again. Let me—there is clearly going to be phenomenal growth from where we are, and I remind you that this is just voice surfaces. We have not even begun to talk about the data services. With all due respect, Mr. Burns, and I know how you have been sensitive to this issue for some time, the issue of study is obviously important because you have to make an informed decision.

Senator BURNS. Well, that is just the beginning.

Mr. WHEELER. Where a study, however, becomes a delay, we are a Nation, both our military and private sector in trouble, and this is a circumstance where our government went out and negotiated

the agreements that identified all of the spectrum. The Defense Department participated in the formulating of that policy. And now we have a situation where the rest of the world has said yes, we will grab that. And we are studying. I recognize the importance of being informed. We cannot let that become an excuse for being immobilized, however, and with all due respect to my friends at the Defense Department, I sometimes feel as though when they say that they have been exploring alternatives, they are doing it with one eye. They are saying we will look at alternatives under certain circumstances. And they have given us a road map as to how if we collectively, and this body has the ability to do that, that kind of collective, broad analysis in effect to rules, how things can work out, and so hopefully, that work that has been done, it is, it is the study, and we can then move on to get some action, because we are falling behind every day.

Mr. COOPER. I am glad we put that chart up there. I am going to sound like a broken record. If you look at the growth of cellular subscribers between—you asked about 20 years. We are talking about 10 times more subscribers in the next 9 years.

Senator BURNS. In other words, that is going to get more precipitous?

Mr. COOPER. If you have 10 times more subscribers and you do not change the technology, you are going to need 10 times more spectrum. I apologize for just continually repeating that. Just adding little hunks of spectrum is not going to solve the long-range problem and that is why I think we need to look at this thing on an actually long-range basis.

Let me answer your question directly because that is what I do. I am not really quite as accountable. Maybe 30 years from now I wouldn't be accountable at all, but 20 years from now, we know technology now that permits you to do true sharing, and that really is what the future is, it is not only the spatial technology I described where you keep reusing the spectrum over and over again, it is the ability to use the spectrum for lots of different services when those services is needed. The bottom line is the crises that require Defense Department spectrum do not necessarily happen at the same time and the same place and the land mobile spectrum and you can move that spectrum around. It is happening with technology, the ability to process information has increased so enormously and it keeps increasing. We will have the ability in 20 years to manage information in such a way that we can make all the spectrum available to all the services. I mean defense, public safety, consumers, children playing games and make sure that everybody gets the appropriate attention, the appropriate priorities, the appropriate speeds and they all get this at whatever the value that they contribute to society.

I tell you, this is not a pipe dream. That the technologies to do this are already in the minds of the researchers and some of that technology, as I tried to describe to you earlier, is available today and as a matter of fact, I am going to be calling on Mr. Strigl I hope over the next month or two and make some of this technology available in the next 2 to 3 years. I did not want to make a sales call in front of this Subcommittee. Thank you.

Mr. MCHENRY. I believe you asked what's our vision in telecommunications. I have been in telecommunications for 21 years, prior to that, information technology, and one of the earlier cellular pioneers and yes, we know each other 15 years or better. I was in the cellular industry for many years and helped bring cellular to many of the U.S. marketplaces and what I have observed is yes, more spectrum has generally been required, primarily to create more competition in the marketplace and in this competition it has fostered the innovation that has driven the efficiencies in the use of spectrum that has been out.

I think it is absolutely clear that more spectrum is not the total solution. I think it is also absolutely clear, particularly in the larger, denser urban environments that more spectrum may be needed and certainly as a migration place for existing carriers to continue to serve existing customers without degrading that service, and have flexibility to introduce new services, whatever 3G may turn out to be. But I would say that the two keys to the future, what telecommunications will look like, particularly wireless telecommunications, is that it will be any amount of communication that a user desires and is willing to pay for anywhere, any time and that demands broadband, and it demands competition to foster innovation, and broadband services are yet to even be defined. I heard a presentation not long ago by some content providers on the West Coast who said bring me 15 to 20 million broadband subscribers, and I will bring you the content that those people will pay for. And yet the last mile, broadband is the stop. It is the stop that will prevent any broadband from being brought to the U.S. marketplace today. The long haul is there. Maybe even more supplying the long haul, but in the wireless piece, and the last small piece whether it be mobile wireless or in fixed wireless which our company contemplates bringing, broadband is stymied, and so what I would say to our vision is any time, any place, any amount of communication, and let the market determine it. Some amount of spectrum may be necessary to get that started, but clearly an overall spectrum policy is necessary to realize that vision, but maybe more importantly is getting broadband to the marketplace sooner rather than later to stimulate innovation and competition.

Mr. KELLEY. There have been some great comments here. We agree completely about competition innovation. We mentioned that previously. If you go back 20 years, sometimes the best way to look forward 20 years is to look back 20 years. If you look back 20 years, 1981 was sort of the dawn of 1G, but first generation mobile telephone, which were large car phones, then 10 years ago, we were on 2G which was CDMA digital networks here in North America.

Now, this year as we mentioned we are going to be deploying third generation technology ourselves this year and early next year. When we look ahead then logically we would say 4Gs and 5Gs, but Mr. McHenry's point, what does that really mean, what it is really going to mean is multimedia communication, visual communication, and the ability to see really anywhere, any time and communication when you need it and access to information that you need when you need it. And to Mr. Cooper's point, ideally this is done in a mobile way, and in a nomadic way and that is really what the

issue is is how to manage the spectrum so that you can get these technological advances that you get through innovation and competition that allow those kinds of services to flourish, and all of the businesses that we have today in this country will then be further enabled with all this wireless technology, and can flourish and innovate themselves and export the innovations they create.

Senator BURNS. Thank you, Mr. Chairman.

Senator INOUE. Thank you.

Senator STEVENS.

Senator STEVENS. I know better than to stand in the way of Conrad's dinner. I won't be long. The chart that mesmerized me was the chart where our country was in red. I really think that is slightly misleading. In that country is the greatest adaptability of the existing technology in the world. You look at the green, those are primarily the countries that are very, very harsh on individual freedom and harsh on the private sector. Conrad did not ask me for my opinion, but I will tell you my opinion. Twenty years from now, I think you will probably be in 40G, Mr. Kelley. I think that the technology is tumbling so fast, and spectrum will almost become immaterial once it really takes off, and what we really ought to do is get out of the way. More than anything else, I think we are delaying this process, and the dollar sign is not the best test, but we believe that the next generation should be more friendly to the consumer and cost less, right? Every generation will do that. I do think that it is coming now and one of the problems I have is that we are delaying this now by our reviews and everything else. I do not know how to get us out of the way yet. But I think one of the ways is to give another economic incentive to move into another area. And I hope that you will help us devise that.

The answers of just getting the Department of Defense out of the way are not sufficient because that is the worst part of our government to try and move and necessarily so, because we are still the strongest power in the world and we are not going to disturb that because some of you need to make more bucks. We want you to use those bucks in a way that makes immaterial how much that spectrum the Department of Defense has in the long run, but I do think we will help you in the interim, and I hope the Congress will listen and take some interim steps to just free up some of this. I hope you would help us work with the FCC. I think the problem is there are delays there, too. There are delays because they are compliant with some complex laws that maybe we ought to take a look at those, too. But my feeling right now is that you, Mr. Kelley, I am really, if you will pardon me, gentlemen, the way you are using your spectrum is right. You are totally using it. And I know we are starting to use spectrum in the hours when schools and libraries and health facilities do not use it, we are using for local communications.

We need to find more ways to use this spectrum in a total manner and on a cooperative manner so that there is not just these lease lines and spectrum reserve for specific use that does not take place but once in a while. That we have got to have more machine gun use of every dot on the dial as far as I am concerned, but I do hope that you will help us convince some of our colleagues to

get moving and do something. Give an incentive to the next era and I think this spectrum problem will help solve itself.

Mr. Chairman, thank you for holding this hearing. I wish that it could be longer. And Mr. Cooper, I owe you lunch, all right. Thank you very much.

Senator INOUE. Thank you. I too would like to join Senator Stevens in expressing my regrets that no other Members of the Subcommittee could be present here. I think this hearing was very important. Your suggestion that a new policy should be looked into because we do not have any policy at this time is a very important observation.

We would like to spend about a week at least chewing over your testimony because frankly, for you to say it is mind boggling is an understatement, but I can assure you that we are intent upon doing something, and we hope that the something we do will be the proper one. With that, the hearing is adjourned.

[Whereupon, at 5:30 p.m., the hearing adjourned.]

